Decision **2005-122**

Phase 3 Final Proceeding Under Bitumen Conservation Requirements in the Athabasca Wabiskaw-McMurray

November 10, 2005

Alberta Energy and Utilities Board

ALBERTA ENERGY AND UTILITIES BOARD
Decision 2005-122: Phase 3 Final Proceeding Under Bitumen Conservation Requirements in the Athabasca Wabiskaw-McMurray

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640 – 5 Avenue SW
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T2P 3G4

Telephone: (403) 297-8311
Fax: (403) 297-7040
E-mail: eub.info_services@eub.gov.ab.ca
Web site: www.eub.gov.ab.ca

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ALBERTA ENERGY AND UTILITIES BOARD
Calgary Alberta

PHASE 3 FINAL PROCEEDING UNDER BITUMEN CONSERVATION REQUIREMENTS IN THE ATHABASCA WABISKAW-MCMURRAY

Decision 2005-122
Proceeding No. 1347905

1 PROCEEDING AND HEARING

General Bulletin (GB) 2003-28: Bitumen Conservation Requirements, Athabasca Wabiskaw-McMurray, issued by the Alberta Energy and Utilities Board (EUB/Board) on July 22, 2003, provides background information on the matter dealt with in this hearing. This hearing was the final hearing under Phase 3 of the Bitumen Conservation Requirements. It was preceded by interim hearings in March and June 2004, which resulted in the Board issuing *Decisions 2004-045*[1] and *2004-062*[2] and Interim Shut-in Orders 04-001, 04-002, and 04-003. On September 15, 2004, the Board held a prehearing meeting to consider submissions on the process and timing for the final hearing. The Board's directions resulting from the prehearing meeting were set out in *Decision 2004-088*.[3]

The public hearing was held from June 14 to August 12, 2005, in Calgary, Alberta, before Board Member J. D. Dilay, P.Eng., and Acting Board Members C. A. Langlo, P.Geol., and G. D. Williams, Ph.D., P.Geol. Parties that attended the hearing are listed in Appendix 1.

2 DECISION

The Board decides that gas production from the intervals listed in Table 1 of this report must remain shut in (for those intervals previously shut in by an interim shut-in order) or must be shut in by January 1, 2006, and that gas is allowed to be produced from the intervals listed in Table 2 of this report, subject to *ID 99-1*[4] applications being required for those intervals that have never produced and/or been completed.

This decision results in the following considerations and requirements:

1) The Board recognizes that some unusual circumstances may arise as a result of this decision and, therefore, it may be appropriate for the Board to grant relief from some of its regulatory requirements. For example, there are requirements related to the suspension and abandonment of wells, pipelines, and other field facilities and requirements pertaining to long-term inactive wells that can trigger liability management considerations. Therefore, the Board is prepared to consider requests for relief from such requirements.

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[1] *Decision 2004-045: Phase 3 Proceedings Under Bitumen Conservation Requirements and Applications for Approval to Produce Gas in the Athabasca Wabiskaw-McMurray Area*, May 31, 2004.

[2] *Decision 2004-062: Review of Wells with Wabiskaw-McMurray Intervals Previously Allowed to Produce Gas by Decision 2003-023—Chard Area and Leismer Field*, July 27, 2004.

[3] *Decision 2004-088: Phase 3 Final Proceeding Under Bitumen Conservation Requirements, Athabasca Wabiskaw-McMurray—Prehearing Meeting Decision*, October 14, 2004.

[4] *Interim Directive (ID) 99-1: Gas/Bitumen Production in Oil Sands Areas—Application, Notification, and Drilling Requirements*, February 3, 1999, and amendments.

2) In overlapping gas pools where one pool is allowed to produce and another is required to be shut in, there must be segregation between the pools in all wellbores or both pools must be shut in. In order to demonstrate segregation in the wellbore, zonal segregation tests must be conducted and submitted to the EUB in accordance with Section 11.150(1) and (2) of the *Oil and Gas Conservation Regulations* to confirm that segregation has been established between a pool that is permitted to produce gas and a pool that is not permitted to produce gas.

In due course the Board will issue a further report providing detailed reasons for its decision. The Board will also issue an order giving effect to its final decision in the Phase 3 Proceedings.

Dated in Calgary, Alberta, on November 10, 2005.

ALBERTA ENERGY AND UTILITIES BOARD

<original signed by>

J. D. Dilay, P.Eng.
Board Member

<original signed by>

C. A. Langlo, P.Geol.
Acting Board Member

<original signed by>

G. D. Williams, Ph.D., P.Geol.
Acting Board Member

Legend for Decision 2005-122 Tables 1 and 2

Company Abbreviations

ANADARKO	ANADARKO CANADA CORPORATION
BAAY LAND	BAAY LAND CONSULTANTS LTD.
BP	BP CANADA ENERGY COMPANY
CALPINE	CALPINE CANADA RESOURCES COMPANY
CANNAT	CANNAT RESOURCES INC.
CNRL	CANADIAN NATURAL RESOURCES LIMITED
CONOCO	CONOCOPHILLIPS CANADA RESOURCES CORP.
DEVON AOG	DEVON AOG CORPORATION
DEVON ARL	DEVON ARL CORPORATION
DEVON	DEVON CANADA CORPORATION
ENCANA	ENCANA OIL & GAS CO. LTD.
ENCANA C.	ENCANA CORPORATION
FIRST	FIRST CHICAGO INVESTMENT CORPORATION
GULF	GULF CANADA LIMITED
HUSKY	HUSKY OIL OPERATIONS LIMITED
ISH	ISH ENERGY LTD.
IMPERIAL	IMPERIAL OIL RESOURCES LIMITED
JCOS	JAPAN CANADA OIL SANDS LTD.
MEG	MEG ENERGY CORP.
NEXEN	NEXEN CANADA LTD.
NORTHSTAR	NORTHSTAR ENERGY CORPORATION
OPTI	OPTI CANADA INC.
PARAMOUNT	PARAMOUNT RESOURCES LTD.
PET	PARAMOUNT ENERGY OPERATING CORP.
PETRO-CANADA	PETRO-CANADA
PRIMEWEST	PRIMEWEST ENERGY INC.
SHELL	SHELL CANADA LIMITED
STYLUS	STYLUS EXPLORATION INC.
SUNCOR	SUNCOR ENERGY INC.
SUPERMAN	SUPERMAN RESOURCES INC.
TALISMAN	TALISMAN ENERGY INC.
VIKING	VIKING ENERGY LTD.

Table 1. Wabiskaw-McMurray Intervals Denied For Gas Production

Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
CHARD	MCMURRAY P	00/10-27-080-06W4/0	246.9	256.9	McM Channel	CNRL
		00/11-28-080-06W4/0	284.2	295.8	McM Channel	CNRL
		00/11-34-080-06W4/0	249.5	260.0	McM Channel	CNRL
	MCMURRAY VV	00/07-13-080-07W4/0	310.2	319.5	McM Channel	CNRL
		00/07-14-080-07W4/0	327.8	328.5	McM Channel	CNRL
CLYDEN	MCMURRAY W	00/07-25-075-13W4/0	507.0	513.0	McM Channel	VIKING
	MCMURRAY Y	00/11-30-076-12W4/0	496.8	501.5	McM Channel	CNRL
CORNER	MCMURRAY A	00/05-31-080-09W4/0	416.0	418.5	McM A1 Seq	PET
		00/12-32-080-09W4/0	418.0	421.0	McM A1 Seq	PET
		00/10-36-080-10W4/0	418.0	420.0	McM A1 Seq	PET
		00/11-04-081-09W4/0	529.3	682.0	McM Channel	PET
		00/14-04-081-09W4/0	425.5	427.5	McM A1 Seq	PET
		02/14-04-081-09W4/0	427.0	428.0	McM A1 Seq	PET
		00/09-05-081-09W4/0	426.0	428.0	McM A1 Seq	PET
		00/09-05-081-09W4/0	428.0	430.0	McM A2 Seq	PET
		00/06-07-081-09W4/0	421.3	424.0	McM A1 Seq	PET
		00/06-07-081-09W4/0	425.0	434.0	McM Channel	PET
		00/15-08-081-09W4/0	423.2	424.0	McM A1 Seq	PET
		00/12-09-081-09W4/0	418.0	420.0	McM A1 Seq	PET
		00/13-09-081-09W4/0	418.5	420.5	McM A1 Seq	GULF
		00/13-09-081-09W4/0	420.7	424.0	McM Channel	GULF
		00/12-16-081-09W4/0	425.0	429.0	McM Channel	PET
		02/12-16-081-09W4/0	431.0	434.2	McM Channel	PET
		00/06-01-081-10W4/0	419.0	421.0	McM A1 Seq	PET
		00/10-11-081-10W4/0	424.2	427.0	McM A1 Seq	PET
		00/10-11-081-10W4/0	427.0	438.5	McM Channel	PET
		00/03-12-081-10W4/0	425.0	426.0	McM A1 Seq	PET
		00/03-12-081-10W4/0	427.1	436.0	McM Channel	PET
		00/12-13-081-10W4/0	422.3	424.5	McM A1 Seq	PET
		00/12-13-081-10W4/0	425.1	433.3	McM Channel	PET
	MCMURRAY AA	00/08-16-080-10W4/0	422.0	432.5	McM Channel	PET
	MCMURRAY C	00/14-27-080-10W4/0	415.5	418.0	McM A1 Seq	PET
		00/14-27-080-10W4/0	418.0	432.8	McM Channel	PET
		00/14-28-080-10W4/0	417.2	419.0	McM A1 Seq	PET
		00/14-28-080-10W4/0	419.0	433.0	McM Channel	PET
		00/09-33-080-10W4/0	417.5	421.0	McM A1 Seq	PET
		00/09-33-080-10W4/0	424.0	435.0	McM Channel	PET
		00/11-34-080-10W4/0	420.0	421.0	McM A1 Seq	PET
		00/11-34-080-10W4/0	432.2	436.0	McM Channel	PET
		00/05-35-080-10W4/0	416.0	419.5	McM A1 Seq	PET
		00/05-35-080-10W4/0	426.0	436.0	McM Channel	PET
		00/03-03-081-10W4/0	421.8	423.5	McM A1 Seq	PRIMEWEST
		00/08-04-081-10W4/0	423.0	424.0	McM A1 Seq	PET
		00/08-04-081-10W4/0	427.0	437.0	McM Channel	PET
		00/08-05-081-10W4/0	433.0	436.5	McM Channel	PET
	MCMURRAY CC	00/10-28-081-09W4/0	428.5	436.0	McM Channel	PET
	MCMURRAY D	00/09-31-080-10W4/0	419.5	421.5	McM A1 Seq	PET
		00/09-31-080-10W4/0	425.0	438.0	McM Channel	PET
		00/11-32-080-10W4/0	423.8	425.0	McM A1 Seq	PET
		00/11-32-080-10W4/0	427.0	441.0	McM Channel	PET
	MCMURRAY G	00/09-10-081-09W4/0	430.2	432.4	McM A1 Seq	PET
		00/09-10-081-09W4/0	435.0	435.8	McM A2 Seq	PET
		00/13-11-081-09W4/0	428.0	429.8	McM A1 Seq	PET
		00/13-11-081-09W4/0	429.8	431.8	McM A2 Seq	PET
		00/02-14-081-09W4/0	432.5	433.7	McM A1 Seq	GULF
		00/11-14-081-09W4/0	430.7	433.0	McM A1 Seq	PET
		00/04-15-081-09W4/0	424.5	427.4	McM A1 Seq	GULF
		00/10-23-081-09W4/0	429.4	430.8	McM A1 Seq	PET
		00/10-23-081-09W4/0	431.7	434.0	McM Channel	PET
		00/07-25-081-09W4/0	426.6	427.8	McM A1 Seq	PET
		00/07-25-081-09W4/0	428.0	431.5	McM Channel	PET
		00/07-26-081-09W4/0	425.0	426.3	McM A1 Seq	PET
		00/07-26-081-09W4/0	427.0	430.5	McM Channel	PET
		00/06-27-081-09W4/0	419.0	421.3	McM A1 Seq	PET
		00/06-27-081-09W4/0	421.7	428.8	McM Channel	PET

Table 1. Wabiskaw-McMurray Intervals Denied For Gas Production

Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
CORNER (cont.)	MCMURRAY J	00/08-23-080-10W4/0	419.0	419.8	McM Channel	PET
	MCMURRAY K	00/06-02-080-10W4/0	436.0	437.0	McM A1 Seq	PET
		00/15-03-080-10W4/0	432.3	433.0	McM A1 Seq	CALPINE
	MCMURRAY MM	00/10-28-081-09W4/0	419.0	421.5	McM A1 Seq	PET
	MCMURRAY P	00/15-03-080-10W4/0	440.8	441.5	McM Channel	CALPINE
	MCMURRAY PP	00/08-23-080-10W4/0	423.0	429.0	McM Channel	PET
	MCMURRAY Q	00/10-13-080-10W4/0	429.0	431.0	McM A1 Seq	PET
		00/07-14-080-10W4/0	419.2	422.0	McM A1 Seq	PET
		00/07-14-080-10W4/0	422.0	424.6	McM Channel	PET
		00/08-15-080-10W4/0	422.0	424.0	McM A1 Seq	PET
		00/08-15-080-10W4/0	425.0	425.8	McM Channel	PET
		00/08-16-080-10W4/0	419.5	420.0	McM A1 Seq	PET
		00/08-23-080-10W4/0	415.4	417.0	McM A1 Seq	PET
		00/16-24-080-10W4/0	418.7	421.0	McM A1 Seq	ENCANA C.
		00/16-24-080-10W4/0	421.0	426.3	McM Channel	ENCANA C.
		00/08-25-080-10W4/0	420.5	423.0	McM A1 Seq	PET
	MCMURRAY U	00/05-31-080-08W4/0	459.5	460.6	McM B1 Seq	NORTHSTAR
		00/11-34-080-09W4/0	448.5	449.5	McM B1 Seq	ENCANA C.
		00/11-35-080-09W4/0	447.0	450.0	McM B1 Seq	ENCANA C.
		00/10-36-080-09W4/0	456.0	456.5	McM B1 Seq	ENCANA
		00/05-01-081-09W4/0	447.1	448.5	McM B1 Seq	PET
	MCMURRAY U/D-061	00/08-15-080-10W4/0	427.5	428.4	McM Channel	PET
DIVIDE	MCMURRAY AA	00/08-02-082-12W4/0	497.0	498.0	McM B2 Seq	STYLUS
	MCMURRAY FF	00/16-08-082-12W4/0	453.5	460.0	McM Channel	HUSKY
	MCMURRAY GG	00/14-05-082-12W4/0	481.7	482.8	McM B2 Seq	PET
		00/07-08-082-12W4/0	473.4	482.8	McM Channel	ANADARKO
	MCMURRAY HH	00/14-31-081-12W4/0	473.5	476.5	McM Channel	HUSKY
	MCMURRAY II	00/08-06-082-12W4/0	475.9	477.0	McM Channel	PET
	MCMURRAY JJ	00/07-09-082-12W4/0	479.4	480.6	McM B2 Seq	PET
	MCMURRAY K	00/07-03-082-12W4/0	478.7	482.4	McM Channel	STYLUS
	MCMURRAY S	00/05-16-082-12W4/0	467.3	474.7	McM Channel	PET
	MCMURRAY U/D-065	00/07-09-082-12W4/0	490.0	496.5	McM C Channel	PET
	MCMURRAY U/D-066	00/10-17-082-12W4/0	454.0	458.8	McM C Channel	PET
	MCMURRAY Y	00/11-01-082-13W4/0	439.8	441.2	McM B2 Seq	HUSKY
DUNCAN	MCMURRAY CCC	00/07-29-077-12W4/0	451.5	452.2	McM B1 Seq	CNRL
	MCMURRAY YY	00/15-22-077-12W4/0	450.5	452.1	McM Channel	CNRL
		00/12-20-077-12W4/0	454.0	455.6	McM Channel	CNRL
		00/06-22-077-12W4/0	456.0	457.0	McM Channel	CNRL
		00/15-18-077-12W4/0	461.7	462.4	McM Channel	CNRL
		00/10-13-077-13W4/0	469.5	471.8	McM Channel	CNRL
EAGLENEST	MCMURRAY U/D-001	00/15-14-101-13W4/0	537.0	538.0	McM Channel	ENCANA
	WABISKAW U/D-002	00/15-14-101-13W4/0	526.5	531.0	Wbsk D Sand	ENCANA
		AA/15-14-101-13W4/0	530.0	530.8	Wbsk D Sand	IMPERIAL
		AA/16-17-101-13W4/0	481.0	488.4	Wbsk D Sand	IMPERIAL
	WABISKAW U/D-007	00/02-20-101-13W4/0	462.0	467.0	Wbsk D Sand	ENCANA
ELLS	WABISKAW C	00/11-19-094-15W4/0	207.9	208.5	Wbsk A Sand	CNRL
		00/13-30-094-15W4/0	216.7	222.5	Wbsk A Sand	ENCANA
		AA/16-30-094-15W4/0	213.3	217.0	Wbsk A Sand	SHELL
		00/12-31-094-15W4/0	219.8	226.0	Wbsk A Sand	ENCANA
		00/14-26-094-16W4/0	224.5	231.0	Wbsk A Sand	ENCANA
		00/11-35-094-16W4/0	232.0	239.0	Wbsk A Sand	ENCANA
		03/06-36-094-16W4/0	225.3	232.2	Wbsk A Sand	ENCANA
		00/05-06-095-15W4/0	235.6	240.8	Wbsk A Sand	ENCANA
		AA/05-06-095-15W4/0	234.0	239.3	Wbsk A Sand	SHELL
		00/08-07-095-15W4/0	262.0	269.5	Wbsk A Sand	ENCANA
		AA/08-07-095-15W4/0	263.0	272.5	Wbsk A Sand	SHELL
		00/05-09-095-15W4/0	238.0	241.5	Wbsk A Sand	ENCANA
		AA/05-10-095-15W4/0	231.9	234.1	Wbsk A Sand	SHELL
		00/05-17-095-15W4/0	275.5	280.0	Wbsk A Sand	ENCANA
		00/02-18-095-15W4/0	276.2	280.0	Wbsk A Sand	ENCANA
		AA/16-18-095-15W4/0	282.5	289.5	Wbsk A Sand	SHELL
		AA/06-21-095-15W4/0	264.6	266.4	Wbsk A Sand	SHELL
		00/05-09-095-16W4/0	232.5	234.1	Wbsk A Sand	ENCANA
		00/06-10-095-16W4/0	236.4	241.0	Wbsk A Sand	ENCANA
		AA/08-11-095-16W4/0	253.6	258.2	Wbsk A Sand	SHELL

Table 1. Wabiskaw-McMurray Intervals Denied For Gas Production

Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
ELLS (cont.)	WABISKAW C (cont.)	00/03-12-095-16W4/0	254.2	257.8	Wbsk A Sand	ENCANA
		AA/03-16-095-16W4/0	224.9	228.6	Wbsk A Sand	SHELL
		00/12-16-095-16W4/0	235.5	239.5	Wbsk A Sand	ENCANA
		00/06-25-095-16W4/0	268.0	272.7	Wbsk A Sand	ENCANA
		00/15-34-095-16W4/0	252.0	255.0	Wbsk A Sand	ENCANA
		AA/15-34-095-16W4/0	253.3	258.5	Wbsk A Sand	SHELL
		00/06-36-095-16W4/0	264.0	268.0	Wbsk A Sand	ENCANA
		00/03-06-096-15W4/0	275.5	280.0	Wbsk A Sand	ENCANA
		00/02-02-096-16W4/0	253.2	260.0	Wbsk A Sand	ENCANA
		00/02-10-096-16W4/0	308.9	313.3	Wbsk A Sand	ENCANA
		00/09-11-096-16W4/0	301.8	306.5	Wbsk A Sand	ENCANA
		00/09-14-096-16W4/0	337.0	341.5	Wbsk A Sand	ENCANA
		00/07-16-096-16W4/0	355.8	359.3	Wbsk A Sand	ENCANA
		00/16-23-096-16W4/0	359.7	364.2	Wbsk A Sand	ENCANA
		00/03-25-096-16W4/0	349.5	355.5	Wbsk A Sand	ENCANA
		00/03-25-096-16W4/0	356.0	358.0	Wbsk C Sand	ENCANA
		AA/03-25-096-16W4/0	351.0	354.5	Wbsk A Sand	IMPERIAL
		AA/03-25-096-16W4/0	356.5	357.5	Wbsk C Sand	IMPERIAL
		AA/03-25-096-16W4/0	359.5	361.5	Wbsk C Sand	ENCANA
		00/08-26-096-16W4/0	374.0	379.5	Wbsk A Sand	ENCANA
	WABISKAW U/D-011	00/03-06-096-15W4/0	293.0	296.0	Wbsk D Sand	ENCANA
	WABISKAW U/D-017	00/03-06-096-15W4/0	291.0	292.0	Wbsk C Sand	ENCANA
GLOVER	MCMURRAY A	00/10-31-075-10W4/0	449.4	455.0	McM Channel	PET
		00/11-32-075-10W4/0	457.0	458.0	McM Channel	PET
HANGINGSTONE	MCMURRAY BB	00/05-27-082-09W4/0	445.7	447.3	McM A1 Seq	NORTHSTAR
		00/08-29-082-09W4/0	438.2	441.3	McM A1 Seq	NORTHSTAR
		00/02-33-082-09W4/0	439.2	442.7	McM A1 Seq	NORTHSTAR
	MCMURRAY C	00/10-20-081-08W4/0	432.8	438.5	McM Channel	PET
	MCMURRAY DDD	00/02-17-082-09W4/0	437.5	439.0	McM A1 Seq	NORTHSTAR
		00/05-18-082-09W4/0	427.0	428.0	McM A1 Seq	NORTHSTAR
	MCMURRAY E	00/09-10-081-10W4/0	440.0	441.0	McM B1 Seq	PET
	MCMURRAY G	00/12-15-081-10W4/0	447.0	458.5	McM Channel	PET
		00/09-21-081-10W4/0	445.0	449.5	McM Channel	PET
		00/07-22-081-10W4/0	448.3	451.5	McM Channel	PET
	MCMURRAY G2G	00/06-05-081-08W4/0	468.0	471.0	McM Channel	NORTHSTAR
		00/05-06-081-08W4/0	455.2	467.0	McM Channel	NORTHSTAR
		00/13-08-081-08W4/0	463.0	465.0	McM Channel	NORTHSTAR
	MCMURRAY G3G	00/01-22-084-11W4/0	292.2	294.2	McM B1 Seq	NORTHSTAR
		AA/01-22-084-11W4/0	290.5	292.0	McM B1 Seq	PETRO-CANADA
	MCMURRAY H2H	00/08-21-081-08W4/0	449.0	455.0	McM Channel	PET
		00/11-22-081-08W4/0	444.7	451.0	McM Channel	CALPINE
		00/12-23-081-08W4/0	445.1	448.0	McM Channel	CALPINE
		00/13-14-082-10W4/0	431.0	432.0	McM Channel	PET
	MCMURRAY I	00/09-20-081-10W4/0	437.0	439.8	McM Channel	PET
	MCMURRAY III	00/10-09-082-10W4/0	419.0	423.4	McM A1 Seq	PET
		00/07-10-082-10W4/0	420.5	422.0	McM A1 Seq	PET
	MCMURRAY JJ	00/06-31-082-09W4/0	436.5	437.8	McM A Channel	NORTHSTAR
	MCMURRAY K2K	00/16-16-081-08W4/0	461.0	463.0	McM Channel	PET
	MCMURRAY KK	00/03-30-082-10W4/0	423.6	428.4	McM Channel	PET
		00/11-25-082-11W4/0	433.0	437.0	McM Channel	PET
	MCMURRAY KKK	00/12-28-081-10W4/0	427.0	431.2	McM Channel	PET
	MCMURRAY L2L	00/09-19-081-08W4/0	430.2	434.0	McM Channel	PET
	MCMURRAY LLL	00/11-35-082-08W4/0	445.0	450.0	McM Channel	NORTHSTAR
		00/06-03-083-08W4/0	445.0	447.0	McM A Channel	NORTHSTAR
	MCMURRAY NNN	00/11-19-081-09W4/0	431.2	432.8	McM Channel	PET
	MCMURRAY O2O	00/14-11-082-08W4/0	443.4	460.0	McM Channel	NORTHSTAR
	MCMURRAY P2P	AA/06-25-082-08W4/0	451.0	460.0	McM Channel	PETRO-CANADA
	MCMURRAY PP	00/12-12-082-11W4/0	435.3	436.5	McM Channel	PET
	MCMURRAY QQQ	00/10-09-082-10W4/0	423.4	427.0	McM Channel	PET
		00/07-10-082-10W4/0	424.5	431.0	McM A Channel	PET
	MCMURRAY RRR	00/06-19-082-09W4/0	430.6	432.5	McM Channel	NORTHSTAR
	MCMURRAY U	AA/06-14-084-11W4/0	312.5	314.3	McM Channel	PETRO-CANADA
		AA/09-15-084-11W4/0	301.8	302.5	McM Channel	PETRO-CANADA
		00/05-13-084-11W4/2	320.0	322.2	McM Channel	NORTHSTAR
		00/06-14-084-11W4/0	314.5	316.8	McM Channel	NORTHSTAR

Table 1. Wabiskaw-McMurray Intervals Denied For Gas Production

Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
HANGINGSTONE (cont.)	MCMURRAY U (cont.)	F1/02-23-084-11W4/0	299.0	300.0	McM Channel	JCOS
	MCMURRAY U/D 074	00/10-19-082-10W4/0	425.5	426.8	McM B1 Seq	PET
	MCMURRAY U/D-043	00/07-10-082-10W4/0	446.7	449.0	McM C Channel	PET
	MCMURRAY U/D-051	00/12-27-082-10W4/0	432.3	433.0	McM Channel	PET
	MCMURRAY U/D-096	00/10-25-082-10W4/0	425.5	426.5	McM A1 Seq	PET
	MCMURRAY U/D-108	00/05-16-081-10W4/0	455.0	459.3	McM Channel	PET
	MCMURRAY U/D-118	00/13-13-084-11W4/0	310.2	311.5	McM Channel	PETRO-CANADA
	MCMURRAY UNDEFINED 3	AA/05-24-081-10W4/0	432.5	436.0	McM Channel	JCOS
	MCMURRAY UNDEFINED 5	AB/06-12-083-08W4/0	441.0	442.0	McM Channel	PETRO-CANADA
	MCMURRAY X	00/11-19-081-09W4/0	422.9	426.5	McM A1 Seq	PET
		00/12-30-081-09W4/0	425.5	429.0	McM A1 Seq	PET
		00/10-25-081-10W4/0	430.0	431.0	McM A1 Seq	PET
		00/10-25-081-10W4/0	434.0	435.5	McM Channel	PET
		00/10-26-081-10W4/0	432.2	434.0	McM Channel	PET
	MCMURRAY Y	00/10-09-082-09W4/0	439.5	440.1	McM A1 Seq	NORTHSTAR
		00/07-15-082-09W4/0	454.0	455.0	McM Channel	NORTHSTAR
	MCMURRAY YYY	00/11-05-082-08W4/0	432.7	433.5	McM A1 Seq	NORTHSTAR
		00/11-05-082-08W4/0	434.0	439.5	McM Channel	NORTHSTAR
		00/10-06-082-08W4/0	432.4	434.0	McM A1 Seq	PETRO-CANADA
		00/10-06-082-08W4/0	434.2	437.7	McM A2 Seq	PETRO-CANADA
		02/10-06-082-08W4/0	432.0	434.0	McM A1 Seq	NORTHSTAR
		02/10-06-082-08W4/0	434.0	436.4	McM A2 Seq	NORTHSTAR
		00/08-07-082-08W4/0	431.2	433.0	McM A1 Seq	NORTHSTAR
		00/08-07-082-08W4/0	433.9	439.5	McM Channel	NORTHSTAR
		00/01-01-082-09W4/0	436.2	437.2	McM A2 Seq	NORTHSTAR
		00/10-11-082-09W4/0	447.2	449.5	McM A1 Seq	NORTHSTAR
		00/10-11-082-09W4/0	450.0	457.0	McM Channel	NORTHSTAR
		00/06-12-082-09W4/0	458.5	459.2	McM A2 Seq	NORTHSTAR
		02/06-12-082-09W4/0	452.0	453.3	McM A1 Seq	NORTHSTAR
		02/06-12-082-09W4/0	454.3	457.0	McM A2 Seq	NORTHSTAR
	MCMURRAY Z	00/15-15-082-09W4/0	449.8	452.3	McM A1 Seq	NORTHSTAR
		00/15-15-082-09W4/0	452.8	457.0	McM Channel	NORTHSTAR
		00/15-16-082-09W4/0	443.5	447.8	McM A1 Seq	NORTHSTAR
		00/15-16-082-09W4/0	449.3	451.3	McM Channel	NORTHSTAR
		00/07-22-082-09W4/0	453.5	455.8	McM A1 Seq	NORTHSTAR
		00/11-23-082-09W4/0	451.9	453.0	McM A1 Seq	NORTHSTAR
	MCMURRAY Z2Z	00/06-11-081-08W4/0	440.0	446.0	McM B1 Channel	NORTHSTAR
	MCMURRAY ZZ	00/02-17-082-09W4/0	440.5	443.0	McM A2 Seq	NORTHSTAR
	WABISKAW A	00/11-35-082-08W4/0	443.0	444.0	Wbsk C Sand	NORTHSTAR
		00/16-36-082-08W4/0	434.8	435.5	Wbsk C Sand	NORTHSTAR
		00/06-01-083-08W4/0	440.0	440.5	Wbsk C Sand	NORTHSTAR
		00/07-30-082-07W4/0	443.3	443.8	Wbsk C Sand	NORTHSTAR
		00/07-02-083-08W4/0	448.0	448.5	Wbsk C Sand	NORTHSTAR
	WABISKAW E	00/10-07-081-10W4/0	426.4	427.8	McM A Channel	PET
		00/11-01-081-11W4/0	427.5	428.6	McM Channel	PET
	WABISKAW-MCMURRAY A	00/13-19-082-08W4/0	455.0	456.0	Wbsk D Valley Fill	NORTHSTAR
		00/13-19-082-08W4/0	459.2	460.0	McM Channel	NORTHSTAR
		00/07-30-082-08W4/0	453.2	454.6	Wbsk D Valley Fill	NORTHSTAR
		00/07-30-082-08W4/0	455.8	458.2	McM Channel	NORTHSTAR
		00/01-36-082-09W4/0	432.5	435.1	McM A1 Seq	NORTHSTAR
		00/01-36-082-09W4/0	435.1	441.1	McM Channel	NORTHSTAR
	WABISKAW-MCMURRAY D	00/11-32-081-07W4/0	437.0	438.9	McM A1 Seq	CALPINE
		00/11-32-081-07W4/0	439.5	440.7	McM A2 Seq	CALPINE
		00/11-25-081-08W4/0	443.0	445.0	Wbsk D Valley Fill	NORTHSTAR
		00/11-25-081-08W4/0	445.0	447.5	McM A2 Seq	NORTHSTAR
		00/15-26-081-08W4/0	438.0	439.5	Wbsk D Valley Fill	CALPINE
		00/15-26-081-08W4/0	439.5	441.3	McM A2 Seq	CALPINE
		00/15-26-081-08W4/0	446.0	447.2	McM Channel	CALPINE
		02/15-27-081-08W4/0	442.1	443.2	McM A Channel	CALPINE
		02/15-27-081-08W4/0	448.0	451.5	McM Channel	CALPINE
		00/15-28-081-08W4/0	433.3	435.0	McM A2 Seq	NORTHSTAR
		00/15-28-081-08W4/0	440.0	442.0	McM Channel	NORTHSTAR
		00/11-29-081-08W4/0	430.0	433.5	McM A2 Seq	PET
		00/07-31-081-08W4/0	433.3	435.4	McM A2 Seq	PET
		00/06-33-081-08W4/0	433.5	435.4	McM A2 Seq	NORTHSTAR

Table 1. Wabiskaw-McMurray Intervals Denied For Gas Production

Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
HANGINGSTONE (cont.)	WABISKAW-MCMURRAY D (cont.)	00/06-33-081-08W4/0	438.4	445.0	McM Channel	NORTHSTAR
		00/09-34-081-08W4/0	437.0	442.0	McM A Channel	NORTHSTAR
		00/09-34-081-08W4/0	445.0	445.8	McM B1 Seq	NORTHSTAR
		02/09-34-081-08W4/0	435.0	438.0	McM A Channel	NORTHSTAR
		00/07-35-081-08W4/0	439.8	441.0	Wbsk D Valley Fill	NORTHSTAR
		00/07-35-081-08W4/0	441.0	446.0	McM A Channel	NORTHSTAR
		00/11-36-081-08W4/0	446.0	447.0	Wbsk D Valley Fill	NORTHSTAR
		00/11-36-081-08W4/0	449.5	453.0	McM A2 Seq	NORTHSTAR
		00/10-24-081-09W4/0	429.5	432.0	McM A2 Seq	PET
	WABISKAW-MCMURRAY E	00/13-03-082-08W4/0	436.1	437.0	Wbsk D Valley Fill	NORTHSTAR
		00/13-03-082-08W4/0	437.6	445.0	McM Channel	NORTHSTAR
		00/12-04-082-08W4/0	432.8	436.0	Wbsk D Valley Fill	NORTHSTAR
		00/12-04-082-08W4/0	437.0	441.0	McM Channel	NORTHSTAR
		00/07-09-082-08W4/0	440.5	441.1	Wbsk D Valley Fill	NORTHSTAR
		00/07-09-082-08W4/0	442.2	443.2	McM A2 Seq	NORTHSTAR
		00/14-11-082-08W4/0	436.0	437.6	Wbsk D Valley Fill	NORTHSTAR
		00/14-11-082-08W4/0	438.5	440.4	McM A2 Seq	NORTHSTAR
		00/07-16-082-08W4/0	450.8	452.5	Wbsk D Valley Fill	NORTHSTAR
		00/10-16-082-08W4/0	453.0	453.7	McM A Channel	PETRO-CANADA
		00/15-17-082-08W4/0	453.4	454.5	McM A1 Seq	NORTHSTAR
		02/15-17-082-08W4/0	454.0	454.8	McM A1 Seq	NORTHSTAR
		00/07-21-082-08W4/0	453.5	454.0	McM A1 Seq	NORTHSTAR
		00/07-21-082-08W4/0	454.9	456.2	McM A2 Seq	NORTHSTAR
		00/15-22-082-08W4/0	457.0	459.3	McM A2 Seq	NORTHSTAR
		AA/10-23-082-08W4/0	455.0	456.0	McM A2 Seq	PETRO-CANADA
		00/06-27-082-08W4/0	450.0	452.0	McM A2 Seq	NORTHSTAR
HARDY	MCMURRAY J	00/08-34-076-04W4/0	349.0	350.0	McM A1 Seq	STYLUS
		00/11-02-077-04W4/0	345.0	348.0	McM A1 Seq	PET
		00/11-03-077-04W4/0	346.5	350.0	McM A1 Seq	PET
		00/07-07-077-04W4/0	339.2	349.6	McM Channel	PET
		00/03-15-077-04W4/0	336.0	338.5	McM A1 Seq	PET
		00/03-15-077-04W4/0	338.5	341.0	McM Channel	PET
		00/02-18-077-04W4/0	343.0	351.0	McM Channel	PET
	MCMURRAY QQ	00/02-18-077-04W4/0	341.0	343.0	McM A1 Seq	PET
	MCMURRAY RR	00/07-11-077-05W4/0	344.5	355.0	McM Channel	PET
		00/05-12-077-05W4/0	340.0	350.0	McM Channel	PET
		00/04-13-077-05W4/0	339.3	347.4	McM Channel	PET
		00/05-24-077-05W4/0	352.5	356.0	McM Channel	PET
	MCMURRAY U/D-074	00/07-30-077-04W4/0	338.5	342.5	McM Channel	SUPERMAN
	MCMURRAY UNDEFINED	AA/11-24-077-06W4/0	326.5	330.0	McM Channel	MEG
	MCMURRAY Z	00/11-30-075-04W4/0	387.5	389.9	McM A1 Seq	STYLUS
		00/02-35-075-05W4/0	389.8	393.2	McM A1 Seq	STYLUS
		00/01-01-076-05W4/0	380.3	382.0	McM A1 Seq	DEVON
	MCMURRAY ZZ	00/09-06-077-04W4/0	329.0	342.5	McM Channel	PET
	WABISKAW G	00/07-06-076-04W4/0	398.0	401.0	Wbsk C Sand	DEVON
		00/01-01-076-05W4/0	376.8	380.0	Wbsk C Sand	DEVON
	WABISKAW M	00/05-19-077-04W4/0	316.0	319.0	Wbsk C Sand	PET
		00/06-20-077-04W4/0	336.5	339.4	Wbsk C Sand	PET
		00/07-30-077-04W4/0	325.8	327.5	Wbsk C Sand	SUPERMAN
		00/02-31-077-04W4/0	318.2	320.0	Wbsk C Sand	PET
		00/04-13-077-05W4/0	332.8	334.0	Wbsk C Sand	PET
		00/11-18-077-05W4/0	317.0	319.0	Wbsk C Sand	PET
		00/11-19-077-05W4/0	316.6	317.3	Wbsk C Sand	PET
		00/08-20-077-05W4/0	325.0	326.2	Wbsk C Sand	PET
		00/11-21-077-05W4/0	322.5	323.5	Wbsk C Sand	CNRL
		00/07-22-077-05W4/0	338.4	339.5	Wbsk C Sand	PET
		00/05-24-077-05W4/0	343.8	346.0	Wbsk C Sand	PET
		00/12-25-077-05W4/0	332.8	333.8	Wbsk C Sand	PET
		00/07-26-077-05W4/0	342.5	343.5	Wbsk C Sand	CNRL
		00/07-27-077-05W4/0	330.2	332.0	Wbsk C Sand	CNRL
		00/11-28-077-05W4/0	324.2	326.0	Wbsk C Sand	PET
		00/05-30-077-05W4/0	319.0	320.4	Wbsk C Sand	CNRL
		00/10-33-077-05W4/0	337.2	338.5	Wbsk C Sand	PET
		00/10-34-077-05W4/0	332.3	334.0	Wbsk C Sand	CNRL
		00/05-35-077-05W4/0	338.5	339.5	Wbsk C Sand	CNRL

Table 1. Wabiskaw-McMurray Intervals Denied For Gas Production

Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
HARDY (cont.)	WABISKAW M (Cont.)	00/10-36-077-05W4/0	333.0	335.0	Wbsk C Sand	PET
		00/09-36-077-06W4/0	322.3	324.0	Wbsk C Sand	DEVON
		00/08-06-078-04W4/0	323.7	324.7	Wbsk C Sand	PET
		00/15-07-078-04W4/0	335.5	336.5	Wbsk C Sand	PET
		00/08-01-078-05W4/0	329.1	330.4	Wbsk C Sand	PET
		00/07-02-078-05W4/0	332.5	333.0	Wbsk C Sand	CNRL
		00/05-04-078-05W4/0	338.0	338.8	Wbsk C Sand	PET
		00/08-05-078-05W4/0	328.9	330.0	Wbsk C Sand	PET
		00/05-07-078-05W4/0	332.1	332.8	Wbsk C Sand	PET
		00/05-08-078-05W4/0	321.0	321.5	Wbsk C Sand	PET
		00/06-12-078-05W4/0	333.1	334.0	Wbsk C Sand	PET
	WABISKAW U/D-011	00/11-30-075-04W4/0	381.7	387.0	Wbsk C Sand	STYLUS
	WABISKAW-MCMURRAY A	00/11-16-076-04W4/0	369.0	370.0	Wbsk C Sand	TALISMAN
		00/13-17-076-04W4/0	373.7	377.2	Wbsk C Sand	PET
		00/13-17-076-04W4/0	378.0	380.5	McM A1 Seq	PET
		00/13-17-076-04W4/0	385.5	392.7	McM Channel	PET
		00/13-19-076-04W4/0	345.7	348.0	Wbsk C Sand	PET
		00/13-19-076-04W4/0	348.8	352.0	McM A1 Seq	PET
		00/13-20-076-04W4/0	366.0	369.0	Wbsk C Sand	PET
		00/13-20-076-04W4/0	370.0	384.0	McM Channel	PET
		00/10-21-076-04W4/0	363.9	367.2	Wbsk C Sand	PETRO-CANADA
		00/06-22-076-04W4/0	375.0	378.0	Wbsk C Sand	TALISMAN
		00/06-28-076-04W4/0	342.5	346.2	Wbsk C Sand	STYLUS
		00/06-28-076-04W4/0	347.0	352.2	McM Channel	STYLUS
		00/10-30-076-04W4/0	347.2	348.6	Wbsk D Valley Fill	PETRO-CANADA
		00/07-31-076-04W4/0	333.8	336.5	Wbsk C Sand	PET
		00/07-31-076-04W4/0	337.5	338.5	McM A1 Seq	PET
		00/13-32-076-04W4/0	332.0	335.5	Wbsk C Sand	PET
		00/13-32-076-04W4/0	336.5	338.2	McM A1 Seq	PET
		00/13-32-076-04W4/0	341.2	346.8	McM Channel	PET
		00/06-33-076-04W4/0	334.5	337.6	Wbsk C Sand	STYLUS
		00/06-33-076-04W4/0	338.8	351.3	McM Channel	STYLUS
		00/08-34-076-04W4/0	344.4	348.0	Wbsk C Sand	STYLUS
		00/15-35-076-04W4/0	346.0	349.8	Wbsk C Sand	PET
		AA/03-30-076-05W4/0	331.8	333.0	Wbsk D Valley Fill	ENCANA
		AA/03-30-076-05W4/0	336.0	337.7	McM Channel	ENCANA
		00/07-30-076-05W4/0	315.2	316.0	Wbsk C Sand	DEVON ARL
		00/07-30-076-05W4/0	319.0	320.8	McM A1 Seq	DEVON ARL
		00/07-32-076-05W4/0	328.5	329.0	Wbsk C Sand	PET
		00/07-32-076-05W4/0	331.0	331.9	McM A1 Seq	PET
		00/07-32-076-05W4/0	335.0	344.5	McM Channel	PET
		00/08-33-076-05W4/0	322.3	323.0	Wbsk C Sand	PET
		00/08-33-076-05W4/0	324.0	325.7	McM A1 Seq	PET
		00/06-34-076-05W4/0	318.5	321.5	Wbsk C Sand	PET
		00/06-34-076-05W4/0	322.1	324.6	McM A1 Seq	PET
		00/06-34-076-05W4/0	334.1	342.9	McM Channel	PET
		00/06-35-076-05W4/0	329.0	331.5	McM A1 Seq	PET
		00/12-36-076-05W4/0	324.7	327.0	Wbsk C Sand	PET
		00/12-36-076-05W4/0	328.0	329.0	McM A Channel	PET
		00/08-25-076-06W4/0	324.0	326.8	McM Channel	DEVON
		00/11-02-077-04W4/0	340.5	344.0	Wbsk C Sand	PET
		00/11-03-077-04W4/0	341.2	345.0	Wbsk C Sand	PET
		00/09-06-077-04W4/0	325.0	328.2	Wbsk C Sand	PET
		00/07-07-077-04W4/0	336.7	338.5	Wbsk C Sand	PET
		00/02-18-077-04W4/0	337.4	340.0	Wbsk C Sand	PET
		00/05-19-077-04W4/0	323.1	329.0	McM Channel	PET
		00/07-30-077-04W4/0	328.5	331.0	Wbsk D Valley Fill	SUPERMAN
		00/02-31-077-04W4/0	321.0	327.1	McM Channel	PET
		00/03-01-077-05W4/0	323.6	324.5	Wbsk C Sand	PET
		00/03-01-077-05W4/0	327.4	334.5	McM Channel	PET
		00/05-03-077-05W4/0	313.5	318.0	Wbsk C Sand	PET
		00/05-03-077-05W4/0	319.0	336.0	McM Channel	PET
		00/11-04-077-05W4/0	330.0	332.0	Wbsk C Sand	PET
		00/11-04-077-05W4/0	333.0	351.0	McM Channel	PET
		00/06-05-077-05W4/0	334.0	336.0	Wbsk C Sand	PET

Table 1. Wabiskaw-McMurray Intervals Denied For Gas Production

Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
HARDY (cont.)	WABISKAW-MCMURRAY A (cont.)	00/06-05-077-05W4/0	336.0	338.3	McM A1 Seq	PET
		00/06-05-077-05W4/0	342.0	349.7	McM Channel	PET
		00/01-07-077-05W4/0	331.0	334.0	McM A1 Seq	PET
		00/06-08-077-05W4/0	354.4	359.0	McM Channel	PET
		00/06-09-077-05W4/0	347.0	351.0	McM Channel	PET
		00/05-10-077-05W4/0	341.0	346.0	McM A2 Seq	PET
		00/07-11-077-05W4/0	332.0	333.5	Wbsk C Sand	PET
		00/07-11-077-05W4/0	335.0	337.3	McM A1 Seq	PET
		00/05-12-077-05W4/0	334.0	336.0	Wbsk C Sand	PET
		00/05-12-077-05W4/0	337.0	338.7	McM A1 Seq	PET
		00/04-13-077-05W4/0	336.0	338.0	McM A1 Seq	PET
		00/11-18-077-05W4/0	319.8	336.0	McM Channel	PET
		00/11-19-077-05W4/0	318.2	325.5	McM A1 Seq	PET
		00/08-20-077-05W4/0	327.0	330.5	McM A1 Seq	PET
		00/11-21-077-05W4/0	324.0	330.5	McM Channel	CNRL
		00/07-22-077-05W4/0	341.0	344.7	McM A1 Seq	PET
		00/05-24-077-05W4/0	347.1	348.5	McM A1 Seq	PET
		00/12-25-077-05W4/0	336.0	352.0	McM Channel	PET
		00/07-26-077-05W4/0	344.5	348.0	McM A1 Seq	CNRL
		00/07-27-077-05W4/0	333.0	334.2	McM A1 Seq	CNRL
		00/07-27-077-05W4/0	335.0	343.5	McM Channel	CNRL
		00/11-28-077-05W4/0	326.5	330.5	McM A1 Seq	PET
		00/05-30-077-05W4/0	321.0	325.5	McM Channel	CNRL
		00/11-31-077-05W4/0	331.0	341.5	McM Channel	DEVON
		00/10-33-077-05W4/0	339.2	342.0	McM A1 Seq	PET
		00/10-33-077-05W4/0	343.0	345.6	McM Channel	PET
		00/10-34-077-05W4/0	335.0	337.4	McM A1 Seq	CNRL
		00/10-34-077-05W4/0	340.6	344.0	McM Channel	CNRL
		00/05-35-077-05W4/0	340.5	343.0	McM A1 Seq	CNRL
		00/10-36-077-05W4/0	336.0	337.0	McM A1 Seq	PET
		00/10-36-077-05W4/0	339.5	345.0	McM Channel	PET
		00/10-10-077-06W4/0	324.2	324.8	Wbsk D Valley Fill	DEVON ARL
		00/07-13-077-06W4/0	321.2	323.0	Wbsk D Valley Fill	PRIMEWEST
		AA/11-24-077-06W4/0	320.0	322.0	Wbsk D Valley Fill	MEG
		00/07-25-077-06W4/0	321.0	325.6	Wbsk D Valley Fill	DEVON
		00/02-26-077-06W4/0	323.0	323.5	Wbsk D Valley Fill	SUPERMAN
		00/07-35-077-06W4/0	327.5	338.4	McM Channel	SUPERMAN
		00/09-36-077-06W4/0	325.3	327.3	Wbsk D Valley Fill	DEVON
		00/09-36-077-06W4/0	327.3	337.0	McM Channel	DEVON
		00/08-06-078-04W4/0	326.0	328.0	McM A1 Seq	PET
		00/08-01-078-05W4/0	331.5	333.2	McM A1 Seq	PET
		00/07-02-078-05W4/0	334.0	335.5	McM A1 Seq	CNRL
		00/07-02-078-05W4/0	336.0	338.0	McM A2 Seq	CNRL
		00/05-04-078-05W4/0	339.5	361.2	McM Channel	PET
		00/08-05-078-05W4/0	331.0	333.0	McM A1 Seq	PET
		00/08-05-078-05W4/0	334.0	335.5	McM A2 Seq	PET
		00/11-06-078-05W4/0	329.2	334.5	McM A2 Seq	DEVON
		00/05-07-078-05W4/0	333.7	337.4	McM A2 Seq	PET
		00/05-08-078-05W4/0	322.0	324.0	McM A1 Seq	PET
		00/05-08-078-05W4/0	325.0	328.0	McM A2 Seq	PET
		00/06-12-078-05W4/0	335.0	336.4	McM A1 Seq	PET
		00/13-01-078-06W4/0	348.5	349.2	McM A1 Seq	SUPERMAN
		00/02-02-078-06W4/0	345.2	350.2	McM Channel	SUPERMAN
		00/12-11-078-06W4/0	360.0	364.4	McM A Channel	DEVON
KIRBY	MCMURRAY UNDEFINED 1	AA/01-34-075-06W4/0	359.0	360.0	McM Channel	ENCANA C.
	MCMURRAY UNDEFINED 2	AA/03-35-075-06W4/0	352.0	354.5	McM Channel	ENCANA C.
	UPPER MANNVILLE A4A	00/10-08-074-06W4/0	389.0	396.0	Wbsk B Valley Fill	BP
	UPPER MANNVILLE B4B	00/06-34-073-08W4/0	467.5	469.5	Wbsk B Valley Fill	PETRO-CANADA
		00/09-34-073-08W4/0	463.0	467.0	Wbsk B Valley Fill	CNRL
		00/10-34-073-08W4/0	460.7	464.4	Wbsk B Valley Fill	CNRL
		00/11-34-073-08W4/0	574.0	933.0	Wbsk B Valley Fill	CNRL
		02/07-03-074-08W4/0	448.2	450.0	Wbsk B Valley Fill	CNRL
		00/11-03-074-08W4/0	452.1	454.4	Wbsk B Valley Fill	CNRL
	UPPER MANNVILLE I	00/02-29-072-06W4/0	501.0	502.0	Wbsk B Valley Fill	ENCANA C.
		00/09-30-072-06W4/0	499.0	500.5	Wbsk B Valley Fill	ENCANA C.

Table 1. Wabiskaw-McMurray Intervals Denied For Gas Production

Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
KIRBY (cont.)	UPPER MANNVILLE I (cont.)	00/10-31-072-06W4/0	506.0	507.0	Wbsk B Valley Fill	ENCANA C.
		00/10-25-072-07W4/0	488.5	489.5	Wbsk B Valley Fill	ENCANA C.
		00/10-36-072-07W4/0	502.0	505.5	Wbsk B Valley Fill	ENCANA C
		00/05-30-073-04W4/0	414.0	427.5	Wbsk B Valley Fill	BP
		02/05-30-073-04W4/0	414.0	425.0	Wbsk B Valley Fill	BP
		00/05-31-073-04W4/0	407.5	417.0	Wbsk B Valley Fill	BP
		00/06-31-073-04W4/0	408.5	417.0	Wbsk B Valley Fill	BP
		00/11-02-073-05W4/0	443.0	444.0	Wbsk B Valley Fill	ENCANA C.
		00/13-09-073-05W4/0	431.0	433.0	Wbsk B Valley Fill	ENCANA
		W0/13-10-073-05W4/0	437.0	440.0	Wbsk B Valley Fill	ENCANA
		00/16-10-073-05W4/0	433.0	436.0	Wbsk B Valley Fill	ENCANA C.
		00/12-11-073-05W4/0	433.0	436.3	Wbsk B Valley Fill	ENCANA C.
		00/15-11-073-05W4/0	430.4	436.0	Wbsk B Valley Fill	ENCANA
		00/07-12-073-05W4/0	448.4	452.0	Wbsk B Valley Fill	ENCANA C.
		00/12-13-073-05W4/0	436.0	443.0	Wbsk B Valley Fill	ENCANA C.
		00/14-13-073-05W4/0	541.3	798.0	Wbsk B Valley Fill	ENCANA C.
		00/15-13-073-05W4/0	428.6	435.8	Wbsk B Valley Fill	ENCANA
		00/10-14-073-05W4/0	432.0	436.5	Wbsk B Valley Fill	ENCANA C.
		00/16-14-073-05W4/0	513.2	743.0	Wbsk B Valley Fill	ENCANA C.
		00/11-15-073-05W4/0	434.0	437.0	Wbsk B Valley Fill	ENCANA C.
		00/16-15-073-05W4/0	437.0	438.0	Wbsk B Valley Fill	ENCANA C.
		00/11-16-073-05W4/0	433.2	436.0	Wbsk B Valley Fill	ENCANA C.
		02/11-16-073-05W4/0	433.0	436.4	Wbsk B Valley Fill	ENCANA C.
		03/11-16-073-05W4/0	507.7	721.0	Wbsk B Valley Fill	ENCANA C.
		00/12-17-073-05W4/0	430.0	433.5	Wbsk B Valley Fill	ENCANA C.
		02/12-17-073-05W4/0	430.0	433.5	Wbsk B Valley Fill	ENCANA C.
		00/13-17-073-05W4/0	517.8	722.0	Wbsk B Valley Fill	ENCANA C.
		00/10-19-073-05W4/0	413.9	417.6	Wbsk B Valley Fill	BP
		00/03-20-073-05W4/0	425.0	428.0	Wbsk B Valley Fill	BP
		00/09-21-073-05W4/0	423.0	428.0	Wbsk B Valley Fill	BP
		00/11-21-073-05W4/0	428.4	429.2	Wbsk B Valley Fill	BP
		00/09-22-073-05W4/0	431.3	437.8	Wbsk B Valley Fill	BP
		00/12-22-073-05W4/0	419.0	425.0	Wbsk B Valley Fill	BP
		00/10-23-073-05W4/0	424.0	433.0	Wbsk B Valley Fill	BP
		03/10-23-073-05W4/0	425.0	434.5	Wbsk B Valley Fill	BP
		00/10-24-073-05W4/0	425.0	434.7	Wbsk B Valley Fill	BP
		02/10-24-073-05W4/0	425.0	435.0	Wbsk B Valley Fill	BP
		00/07-25-073-05W4/0	422.8	437.7	Wbsk B Valley Fill	BAAY LAND
		02/07-25-073-05W4/0	422.8	437.7	Wbsk B Valley Fill	BP
		00/09-25-073-05W4/0	422.5	435.0	Wbsk B Valley Fill	BP
		00/16-26-073-05W4/0	413.0	425.0	Wbsk B Valley Fill	BP
		02/16-26-073-05W4/0	415.0	427.0	Wbsk B Valley Fill	BP
		00/07-27-073-05W4/0	410.9	420.0	Wbsk B Valley Fill	BP
		00/10-29-073-05W4/0	408.0	415.6	Wbsk B Valley Fill	BP
		00/09-32-073-05W4/0	400.0	405.8	Wbsk B Valley Fill	BP
		00/06-33-073-05W4/0	405.0	410.1	Wbsk B Valley Fill	BP
		00/08-34-073-05W4/0	401.0	413.5	Wbsk B Valley Fill	BP
		02/08-34-073-05W4/0	401.2	414.6	Wbsk B Valley Fill	BP
		00/07-35-073-05W4/0	403.4	416.6	Wbsk B Valley Fill	BP
		02/07-35-073-05W4/0	401.5	413.7	Wbsk B Valley Fill	BP
		03/07-35-073-05W4/0	401.0	411.0	Wbsk B Valley Fill	BP
		00/08-36-073-05W4/0	407.5	421.0	Wbsk B Valley Fill	BP
		02/08-36-073-05W4/0	407.0	420.0	Wbsk B Valley Fill	BP
		00/07-04-073-06W4/0	457.0	459.0	Wbsk B Valley Fill	ENCANA C.
		00/06-05-073-06W4/0	472.0	473.0	Wbsk B Valley Fill	ENCANA C.
		00/06-06-073-06W4/0	485.0	485.4	Wbsk B Valley Fill	ENCANA C.
		00/06-07-073-06W4/0	471.6	473.2	Wbsk B Valley Fill	ENCANA C.
		00/06-08-073-06W4/0	458.6	462.3	Wbsk B Valley Fill	ENCANA C.
		00/07-08-073-06W4/0	532.9	814.0	Wbsk B Valley Fill	ENCANA C.
		00/11-09-073-06W4/0	435.5	444.8	Wbsk B Valley Fill	ENCANA C.
		00/14-09-073-06W4/0	554.5	793.5	Wbsk B Valley Fill	ENCANA C.
		00/05-10-073-06W4/0	443.0	447.0	Wbsk B Valley Fill	ENCANA C.
		00/04-15-073-06W4/0	442.0	448.6	Wbsk B Valley Fill	ENCANA
		00/11-15-073-06W4/0	431.0	434.1	Wbsk B Valley Fill	ENCANA C.
		00/02-16-073-06W4/0	429.8	434.2	Wbsk B Valley Fill	ENCANA C.

Table 1. Wabiskaw-McMurray Intervals Denied For Gas Production

Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
KIRBY (cont.)	UPPER MANNVILLE I (cont.)	00/01-17-073-06W4/0	441.8	444.4	Wbsk B Valley Fill	ENCANA
		00/11-17-073-06W4/0	431.2	432.3	Wbsk B Valley Fill	ENCANA C.
		00/06-18-073-06W4/0	438.6	440.5	Wbsk B Valley Fill	ENCANA C.
		00/02-21-073-06W4/0	421.0	424.0	Wbsk B Valley Fill	BP
		00/11-22-073-06W4/0	419.2	422.8	Wbsk B Valley Fill	BP
		00/16-22-073-06W4/0	421.2	426.3	Wbsk B Valley Fill	BP
		00/11-25-073-06W4/0	410.0	413.3	Wbsk B Valley Fill	BP
		00/09-26-073-06W4/0	415.0	416.4	Wbsk B Valley Fill	BP
		00/11-32-073-06W4/0	398.5	402.0	Wbsk B Valley Fill	BP
		00/07-33-073-06W4/0	401.5	406.0	Wbsk B Valley Fill	BP
		00/11-34-073-06W4/0	392.6	397.2	Wbsk B Valley Fill	BP
		00/10-36-073-06W4/0	396.3	400.0	Wbsk B Valley Fill	BP
		00/10-11-073-07W4/0	487.5	492.0	Wbsk B Valley Fill	ENCANA C.
		00/10-12-073-07W4/0	469.9	476.2	Wbsk B Valley Fill	ENCANA C.
		00/05-14-073-07W4/0	481.0	482.9	Wbsk B Valley Fill	ENCANA
		00/06-16-073-07W4/0	497.0	499.0	Wbsk B Valley Fill	ENCANA C.
		00/10-16-073-07W4/0	502.8	504.0	Wbsk B Valley Fill	ENCANA
		AA/09-20-073-07W4/0	485.5	487.4	Wbsk B Valley Fill	CNRL
		00/10-20-073-07W4/0	485.0	486.7	Wbsk B Valley Fill	CNRL
		02/10-20-073-07W4/0	482.0	484.0	Wbsk B Valley Fill	CNRL
		05/11-20-073-07W4/0	480.0	482.0	Wbsk B Valley Fill	CNRL
		AA/14-20-073-07W4/0	479.7	483.0	Wbsk B Valley Fill	CNRL
		00/15-20-073-07W4/0	482.0	485.0	Wbsk B Valley Fill	CNRL
		02/15-20-073-07W4/0	477.0	478.5	Wbsk B Valley Fill	CNRL
		04/15-20-073-07W4/0	482.0	485.0	Wbsk B Valley Fill	CNRL
		AA/16-20-073-07W4/0	482.0	486.0	Wbsk B Valley Fill	CNRL
		AA/02-21-073-07W4/0	495.0	497.0	Wbsk B Valley Fill	CNRL
		AA/04-21-073-07W4/0	483.5	487.3	Wbsk B Valley Fill	CNRL
		AA/08-21-073-07W4/0	489.5	492.2	Wbsk B Valley Fill	CNRL
		00/09-21-073-07W4/0	482.0	484.3	Wbsk B Valley Fill	CNRL
		00/11-21-073-07W4/0	486.0	488.9	Wbsk B Valley Fill	CNRL
		00/14-21-073-07W4/0	486.0	487.6	Wbsk B Valley Fill	CNRL
		00/09-22-073-07W4/0	467.4	469.8	Wbsk B Valley Fill	BP
		00/11-23-073-07W4/0	460.0	463.0	Wbsk B Valley Fill	BP
		02/11-23-073-07W4/0	460.5	464.5	Wbsk B Valley Fill	BP
		00/08-24-073-07W4/0	439.0	439.5	Wbsk B Valley Fill	BP
		00/11-24-073-07W4/0	439.0	440.0	Wbsk B Valley Fill	BP
		AA/08-30-073-07W4/0	481.3	482.0	Wbsk B Valley Fill	CNRL
		00/10-30-073-07W4/0	478.0	478.5	Wbsk B Valley Fill	CNRL
		00/11-05-074-04W4/0	368.0	381.1	Wbsk B Valley Fill	BP
		00/12-06-074-04W4/0	365.0	383.5	Wbsk B Valley Fill	BP
		02/12-06-074-04W4/0	365.0	382.0	Wbsk B Valley Fill	BP
		00/06-07-074-04W4/0	346.0	366.0	Wbsk B Valley Fill	BP
		00/10-08-074-04W4/0	344.0	357.0	Wbsk B Valley Fill	BP
		00/03-09-074-04W4/0	376.3	384.0	Wbsk B Valley Fill	BP
		00/05-17-074-04W4/0	337.0	352.0	Wbsk B Valley Fill	BP
		02/05-17-074-04W4/0	337.5	352.0	Wbsk B Valley Fill	BP
		00/06-17-074-04W4/0	337.0	351.0	Wbsk B Valley Fill	BP
		00/06-18-074-04W4/0	343.3	359.0	Wbsk B Valley Fill	BP
		00/01-01-074-05W4/0	380.0	397.0	Wbsk B Valley Fill	BP
		00/11-01-074-05W4/0	373.0	389.0	Wbsk B Valley Fill	BP
		00/16-01-074-05W4/0	360.0	377.7	Wbsk B Valley Fill	BAAY LAND
		00/10-02-074-05W4/0	372.7	385.0	Wbsk B Valley Fill	BP
		00/09-03-074-05W4/0	371.3	387.0	Wbsk B Valley Fill	BP
		00/10-03-074-05W4/0	372.3	387.3	Wbsk B Valley Fill	BP
		00/07-04-074-05W4/0	387.0	397.0	Wbsk B Valley Fill	BP
		00/07-05-074-05W4/0	385.0	391.4	Wbsk B Valley Fill	BP
		02/07-05-074-05W4/0	387.5	394.0	Wbsk B Valley Fill	BP
		00/05-06-074-05W4/0	371.7	381.0	Wbsk B Valley Fill	BP
		00/07-06-074-05W4/0	375.0	383.2	Wbsk B Valley Fill	BP
		00/15-07-074-05W4/0	365.5	376.0	Wbsk B Valley Fill	BP
		02/15-07-074-05W4/0	365.3	372.0	Wbsk B Valley Fill	BP
		00/12-08-074-05W4/0	377.5	386.0	Wbsk B Valley Fill	BP
		02/12-08-074-05W4/0	378.0	387.4	Wbsk B Valley Fill	BP
		00/06-09-074-05W4/0	364.5	374.3	Wbsk B Valley Fill	BP

Table 1. Wabiskaw-McMurray Intervals Denied For Gas Production

Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
KIRBY (cont.)	UPPER MANNVILLE I (cont.)	00/05-11-074-05W4/0	369.0	382.4	Wbsk B Valley Fill	BP
		00/07-12-074-05W4/0	352.7	369.0	Wbsk B Valley Fill	BP
		00/10-13-074-05W4/0	398.7	415.1	Wbsk B Valley Fill	BP
		02/10-13-074-05W4/0	399.0	414.0	Wbsk B Valley Fill	BP
		00/10-14-074-05W4/0	389.9	405.2	Wbsk B Valley Fill	BP
		02/10-14-074-05W4/0	390.0	404.0	Wbsk B Valley Fill	BP
		00/12-16-074-05W4/0	398.7	409.0	Wbsk B Valley Fill	BP
		00/14-16-074-05W4/0	393.0	398.0	Wbsk B Valley Fill	BP
		00/10-17-074-05W4/0	392.0	403.1	Wbsk B Valley Fill	BP
		00/12-18-074-05W4/0	374.6	384.0	Wbsk B Valley Fill	BP
		00/07-19-074-05W4/0	396.2	407.5	Wbsk B Valley Fill	BP
		00/15-20-074-05W4/0	401.0	406.0	Wbsk B Valley Fill	BP
		00/06-21-074-05W4/0	418.0	424.0	Wbsk B Valley Fill	BP
		00/08-21-074-05W4/0	405.7	412.4	Wbsk B Valley Fill	BAAY LAND
		00/06-22-074-05W4/0	392.6	401.2	Wbsk B Valley Fill	BP
		00/11-30-074-05W4/0	431.0	435.0	Wbsk B Valley Fill	BP
		00/12-30-074-05W4/0	432.7	441.0	Wbsk B Valley Fill	BP
		00/13-01-074-06W4/0	381.0	391.5	Wbsk B Valley Fill	BP
		00/11-02-074-06W4/0	397.0	401.0	Wbsk B Valley Fill	BP
		00/09-04-074-06W4/0	398.7	403.0	Wbsk B Valley Fill	BP
		00/11-05-074-06W4/0	388.0	393.5	Wbsk B Valley Fill	BP
		00/10-07-074-06W4/0	403.3	407.2	Wbsk B Valley Fill	BP
		00/10-09-074-06W4/0	379.0	384.5	Wbsk B Valley Fill	BP
		00/10-11-074-06W4/0	386.0	397.0	Wbsk B Valley Fill	BP
		00/12-12-074-06W4/0	377.5	389.5	Wbsk B Valley Fill	BP
		00/10-13-074-06W4/0	373.4	381.9	Wbsk B Valley Fill	BP
		00/10-15-074-06W4/0	371.0	381.0	Wbsk B Valley Fill	BP
		00/14-16-074-06W4/0	377.0	386.0	Wbsk B Valley Fill	BP
		00/14-17-074-06W4/0	390.0	398.0	Wbsk B Valley Fill	BP
		00/06-19-074-06W4/0	402.0	404.0	Wbsk B Valley Fill	BP
		00/06-20-074-06W4/0	386.5	393.0	Wbsk B Valley Fill	BP
		00/07-20-074-06W4/0	386.0	392.7	Wbsk B Valley Fill	BP
		00/08-21-074-06W4/0	374.0	381.0	Wbsk B Valley Fill	BP
		00/08-22-074-06W4/0	370.0	382.0	Wbsk B Valley Fill	BP
		00/08-23-074-06W4/0	377.4	384.0	Wbsk B Valley Fill	BP
		00/08-24-074-06W4/0	391.5	400.0	Wbsk B Valley Fill	BP
		00/10-24-074-06W4/0	386.0	397.0	Wbsk B Valley Fill	BP
		00/04-25-074-06W4/0	410.5	416.5	Wbsk B Valley Fill	BP
		00/11-25-074-06W4/0	428.2	437.0	Wbsk B Valley Fill	BP
		00/03-26-074-06W4/0	400.5	405.0	Wbsk B Valley Fill	BP
		00/10-26-074-06W4/0	412.2	421.1	Wbsk B Valley Fill	BP
		00/03-27-074-06W4/0	386.0	391.0	Wbsk B Valley Fill	BP
		00/09-27-074-06W4/0	417.0	420.0	Wbsk B Valley Fill	BP
		00/09-28-074-06W4/0	382.5	384.5	Wbsk B Valley Fill	BP
		00/10-29-074-06W4/0	382.2	384.7	Wbsk B Valley Fill	BP
		00/09-30-074-06W4/0	400.9	403.0	Wbsk B Valley Fill	BP
		00/11-31-074-06W4/0	386.0	388.2	Wbsk B Valley Fill	BP
		00/08-33-074-06W4/0	390.6	393.5	Wbsk B Valley Fill	BP
		00/12-34-074-06W4/0	411.0	412.0	Wbsk B Valley Fill	BP
		00/11-23-074-07W4/0	415.0	417.2	Wbsk B Valley Fill	CNRL
		00/05-24-074-07W4/0	412.5	415.5	Wbsk B Valley Fill	BP
		00/02-25-074-07W4/0	406.6	408.0	Wbsk B Valley Fill	BP
		00/10-01-075-07W4/0	384.0	386.0	Wbsk B Valley Fill	BP
	UPPER MANNVILLE II	00/10-34-074-09W4/0	435.0	436.0	Wbsk B Valley Fill	CNRL
		00/16-35-074-09W4/0	448.1	449.5	Wbsk B Valley Fill	ISH
		00/10-01-075-09W4/0	439.0	441.0	Wbsk B Valley Fill	ISH
		00/10-02-075-09W4/0	433.0	433.5	Wbsk B Valley Fill	ISH
	UPPER MANNVILLE J	00/10-05-073-07W4/0	450.6	451.2	Wbsk B Valley Fill	ENCANA C.
		00/11-07-073-07W4/0	449.0	450.0	Wbsk B Valley Fill	ENCANA C.
		00/07-19-073-07W4/0	485.0	486.0	Wbsk B Valley Fill	CNRL
		00/10-03-073-08W4/0	475.5	476.5	Wbsk B Valley Fill	PETRO-CANADA
		00/10-08-073-08W4/0	475.0	476.0	Wbsk B Valley Fill	ENCANA C.
		00/06-09-073-08W4/0	472.0	472.5	Wbsk B Valley Fill	ENCANA
		00/06-10-073-08W4/0	474.5	475.5	Wbsk B Valley Fill	ENCANA C.
		00/10-13-073-08W4/0	462.0	463.5	Wbsk B Valley Fill	ENCANA C.

Table 1. Wabiskaw-McMurray Intervals Denied For Gas Production

Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
KIRBY (cont.)	UPPER MANNVILLE J (cont.)	00/11-14-073-08W4/0	471.6	475.2	Wbsk B Valley Fill	ENCANA
		00/10-15-073-08W4/0	479.8	482.2	Wbsk B Valley Fill	ENCANA C.
		00/09-17-073-08W4/0	464.0	465.0	Wbsk B Valley Fill	ENCANA
		00/10-17-073-08W4/0	462.3	463.2	Wbsk B Valley Fill	ENCANA C.
		00/15-18-073-08W4/0	454.0	456.3	Wbsk B Valley Fill	ENCANA C.
		00/09-19-073-08W4/0	451.5	453.0	Wbsk B Valley Fill	CNRL
		00/16-20-073-08W4/0	459.0	463.0	Wbsk B Valley Fill	ISH
		00/16-21-073-08W4/0	485.3	486.7	Wbsk B Valley Fill	ISH
		00/16-22-073-08W4/0	483.2	484.2	Wbsk B Valley Fill	ISH
		00/16-23-073-08W4/0	461.2	462.8	Wbsk B Valley Fill	ISH
		00/10-24-073-08W4/0	456.4	460.5	Wbsk B Valley Fill	CNRL
		00/01-25-073-08W4/0	461.5	463.5	Wbsk B Valley Fill	CNRL
		00/11-25-073-08W4/0	459.0	460.2	Wbsk B Valley Fill	CNRL
	UPPER MANNVILLE J4J	00/12-36-074-07W4/0	395.8	398.7	Wbsk B Valley Fill	BP
		00/11-05-075-06W4/0	382.2	383.4	Wbsk B Valley Fill	BP
		00/07-01-075-07W4/0	384.2	386.2	Wbsk B Valley Fill	BP
	UPPER MANNVILLE K4K	00/03-21-074-07W4/0	442.5	444.5	Wbsk B Valley Fill	CNRL
	UPPER MANNVILLE U2U	00/11-27-073-08W4/0	476.8	478.2	Wbsk B Valley Fill	ISH
		00/11-29-073-08W4/0	451.5	454.0	Wbsk B Valley Fill	ISH
		00/05-31-073-08W4/0	439.5	443.0	Wbsk B Valley Fill	CNRL
		00/06-32-073-08W4/0	441.8	443.5	Wbsk B Valley Fill	CNRL
		02/10-33-073-08W4/0	460.2	463.0	Wbsk B Valley Fill	CNRL
		AA/06-35-073-08W4/0	460.7	461.6	Wbsk B Valley Fill	CNRL
		00/02-25-073-09W4/0	431.0	433.0	Wbsk B Valley Fill	PET
		00/16-27-073-09W4/0	427.0	429.0	Wbsk B Valley Fill	PET
		00/10-35-073-09W4/0	536.0	715.0	Wbsk B Valley Fill	PET
		00/07-36-073-09W4/0	436.0	439.0	Wbsk B Valley Fill	PET
		00/10-36-073-09W4/0	534.0	686.0	Wbsk B Valley Fill	PET
		00/03-05-074-08W4/0	449.0	451.7	Wbsk B Valley Fill	CNRL
		00/01-06-074-08W4/0	442.2	444.0	Wbsk B Valley Fill	CNRL
		00/06-06-074-08W4/0	436.0	437.0	Wbsk B Valley Fill	PETRO-CANADA
		00/11-01-074-09W4/0	424.4	426.8	Wbsk B Valley Fill	CNRL
		00/10-02-074-09W4/0	428.5	430.5	Wbsk B Valley Fill	CNRL
		00/09-03-074-09W4/0	423.0	426.0	Wbsk B Valley Fill	ISH
		00/10-11-074-09W4/0	423.5	424.8	Wbsk B Valley Fill	CNRL
		00/10-14-074-09W4/0	420.0	421.0	Wbsk B Valley Fill	CNRL
		02/10-14-074-09W4/0	420.7	423.2	Wbsk B Valley Fill	CNRL
		00/01-23-074-09W4/0	421.0	427.0	Wbsk B Valley Fill	ISH
		00/04-24-074-09W4/0	421.0	422.0	Wbsk B Valley Fill	CNRL
	UPPER MANNVILLE V2V	00/07-36-073-08W4/0	486.7	487.8	Wbsk B Valley Fill	CNRL
		00/12-16-074-07W4/0	443.5	444.5	Wbsk B Valley Fill	ISH
		00/10-18-074-07W4/0	460.0	461.0	Wbsk B Valley Fill	CNRL
		00/14-18-074-07W4/0	459.2	461.2	Wbsk B Valley Fill	ISH
		00/05-19-074-07W4/0	458.0	459.0	Wbsk B Valley Fill	ISH
		00/10-01-074-08W4/0	483.0	483.5	Wbsk B Valley Fill	CNRL
		00/07-07-074-08W4/0	439.5	441.5	Wbsk B Valley Fill	CNRL
		00/06-08-074-08W4/0	456.6	459.0	Wbsk B Valley Fill	CNRL
		00/10-09-074-08W4/0	456.5	458.8	Wbsk B Valley Fill	CNRL
		00/11-10-074-08W4/0	453.7	455.6	Wbsk B Valley Fill	CNRL
		00/02-11-074-08W4/0	467.0	468.0	Wbsk B Valley Fill	ISH
		00/10-11-074-08W4/0	473.2	475.0	Wbsk B Valley Fill	ISH
		00/12-11-074-08W4/0	453.3	455.4	Wbsk B Valley Fill	ISH
		00/09-12-074-08W4/0	472.9	473.9	Wbsk B Valley Fill	ISH
		00/14-12-074-08W4/0	480.3	482.6	Wbsk B Valley Fill	ISH
		00/10-13-074-08W4/0	470.3	474.0	Wbsk B Valley Fill	ISH
		00/11-13-074-08W4/0	477.5	480.0	Wbsk B Valley Fill	ISH
		00/13-13-074-08W4/0	468.0	469.0	Wbsk B Valley Fill	ISH
		00/09-14-074-08W4/0	462.3	463.0	Wbsk B Valley Fill	ISH
		00/10-14-074-08W4/0	458.7	460.2	Wbsk B Valley Fill	ISH
		00/11-14-074-08W4/0	455.0	457.0	Wbsk B Valley Fill	ISH
		00/12-14-074-08W4/0	450.8	453.5	Wbsk B Valley Fill	ISH
		00/15-14-074-08W4/0	456.0	457.0	Wbsk B Valley Fill	ISH
		00/16-14-074-08W4/0	464.5	467.0	Wbsk B Valley Fill	ISH
		00/06-15-074-08W4/0	447.0	448.5	Wbsk B Valley Fill	CNRL
		00/01-16-074-08W4/0	453.3	456.0	Wbsk B Valley Fill	CNRL

Table 1. Wabiskaw-McMurray Intervals Denied For Gas Production

Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
KIRBY (cont.)	UPPER MANNVILLE V2V (cont.)	00/01-17-074-08W4/0	454.3	456.5	Wbsk B Valley Fill	CNRL
		00/10-17-074-08W4/0	456.0	457.0	Wbsk B Valley Fill	CNRL
		00/01-18-074-08W4/0	444.1	446.0	Wbsk B Valley Fill	CNRL
		00/02-19-074-08W4/0	427.0	429.0	Wbsk B Valley Fill	CNRL
		00/09-20-074-08W4/0	446.0	447.8	Wbsk B Valley Fill	CNRL
		00/11-22-074-08W4/0	469.0	471.5	Wbsk B Valley Fill	CNRL
		00/12-23-074-08W4/0	462.3	464.0	Wbsk B Valley Fill	CNRL
		00/06-24-074-08W4/0	465.9	466.8	Wbsk B Valley Fill	ISH
		00/10-12-074-09W4/0	429.0	432.0	Wbsk B Valley Fill	CNRL
		00/10-13-074-09W4/0	422.0	423.0	Wbsk B Valley Fill	CNRL
	UPPER MANNVILLE YYY	00/08-13-072-06W4/0	474.1	477.3	Wbsk B Valley Fill	ENCANA
		00/07-14-072-06W4/0	471.0	472.8	Wbsk B Valley Fill	ENCANA C.
		00/08-16-072-06W4/0	477.0	478.0	Wbsk B Valley Fill	ENCANA C.
	WABISKAW UNDEFINED	AA/03-35-075-06W4/0	345.0	345.9	Wbsk C Sand	ENCANA C.
	WABISKAW-MCMURRAY A	00/07-19-074-04W4/0	407.0	408.5	Wbsk C Sand	BP
		02/07-20-074-04W4/0	396.5	398.0	Wbsk C Sand	BP
		02/07-20-074-04W4/0	398.0	401.5	McM A1 Seq	BP
		00/10-29-074-04W4/0	386.0	390.0	Wbsk C Sand	BP
		00/10-29-074-04W4/0	390.0	392.0	McM A1 Seq	BP
		00/11-30-074-04W4/0	371.0	372.0	Wbsk C Sand	BP
		00/11-30-074-04W4/0	373.5	376.0	McM A1 Seq	BP
		02/15-30-074-04W4/0	366.0	369.0	McM A Channel	BP
		00/03-31-074-04W4/0	361.0	362.0	Wbsk C Sand	DEVON AOG
		00/03-31-074-04W4/0	362.0	369.0	McM A Channel	DEVON AOG
		02/03-31-074-04W4/0	364.5	371.0	McM A Channel	DEVON AOG
		00/06-31-074-04W4/0	361.5	362.0	Wbsk C Sand	DEVON AOG
		00/06-31-074-04W4/0	362.0	369.5	McM A Channel	DEVON AOG
		00/10-25-074-05W4/0	375.0	376.0	Wbsk C Sand	BP
		00/10-25-074-05W4/0	377.0	381.0	McM A1 Seq	BP
		02/10-25-074-05W4/0	376.0	377.0	Wbsk C Sand	BP
		02/10-25-074-05W4/0	377.0	379.0	McM A1 Seq	BP
		00/14-35-074-05W4/0	377.0	378.0	Wbsk C Sand	BP
		00/14-35-074-05W4/0	380.5	390.0	McM A Channel	BP
		03/14-35-074-05W4/0	379.0	380.0	Wbsk C Sand	BP
		03/14-35-074-05W4/0	382.0	387.0	McM A Channel	BP
		03/14-35-074-05W4/0	390.0	390.6	McM A Channel	BP
		00/02-36-074-05W4/0	351.5	353.0	Wbsk C Sand	BP
		00/03-36-074-05W4/0	347.5	351.0	Wbsk C Sand	BP
		00/03-36-074-05W4/0	351.0	353.0	McM Channel	BP
		00/11-01-075-05W4/0	356.0	359.0	Wbsk C Sand	BP
		00/13-02-075-05W4/0	390.0	391.1	Wbsk C Sand	BP
		00/08-09-075-05W4/0	372.0	374.0	Wbsk C Sand	DEVON AOG
		02/08-09-075-05W4/0	373.0	374.3	Wbsk C Sand	DEVON AOG
		00/15-10-075-05W4/0	376.5	379.0	McM A1 Seq	BP
		00/13-11-075-05W4/0	364.7	370.0	Wbsk C Sand	BP
		00/05-12-075-05W4/0	362.0	365.8	Wbsk C Sand	BP
		00/04-14-075-05W4/0	371.8	377.0	Wbsk C Sand	DEVON AOG
		00/02-15-075-05W4/0	367.0	370.5	Wbsk C Sand	BP
		00/02-15-075-05W4/0	370.5	379.0	Wbsk D Valley Fill	BP
		00/07-15-075-05W4/0	368.2	370.5	Wbsk C Sand	BP
		00/07-15-075-05W4/0	370.5	378.5	Wbsk D Valley Fill	BP
		02/07-15-075-05W4/0	368.2	370.5	Wbsk C Sand	BP
		02/07-15-075-05W4/0	370.5	378.5	Wbsk D Valley Fill	BP
		00/08-16-075-05W4/0	372.0	374.8	McM A1 Seq	DEVON AOG
		00/01-21-075-05W4/0	370.8	374.6	McM A1 Seq	DEVON AOG
		00/03-22-075-05W4/0	369.6	370.0	Wbsk C Sand	DEVON AOG
		00/03-22-075-05W4/0	371.0	374.0	McM A1 Seq	DEVON AOG
		00/11-22-075-05W4/0	373.8	376.0	McM A1 Seq	DEVON AOG
		00/04-23-075-05W4/0	364.9	370.0	Wbsk C Sand	DEVON ARL
		AA/11-23-075-05W4/0	363.0	364.0	McM A1 Seq	CNRL
		00/06-27-075-05W4/0	377.5	380.0	McM A1 Seq	DEVON AOG
		00/06-28-075-05W4/0	376.0	380.0	McM A1 Seq	DEVON AOG
		00/12-30-075-05W4/0	372.5	377.0	Wbsk D Valley Fill	DEVON
		00/11-32-075-05W4/0	368.5	369.5	Wbsk C Sand	PET
		00/11-32-075-05W4/0	370.0	374.8	Wbsk D Valley Fill	PET

Table 1. Wabiskaw-McMurray Intervals Denied For Gas Production

Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
KIRBY (cont.)	WABISKAW-MCMURRAY A (cont.)	00/01-33-075-05W4/0	367.9	369.0	Wbsk C Sand	TALISMAN
		00/01-33-075-05W4/0	370.6	374.3	McM A1 Seq	TALISMAN
		00/11-33-075-05W4/0	363.5	366.0	Wbsk C Sand	TALISMAN
		00/11-33-075-05W4/0	366.0	369.5	Wbsk D Valley Fill	TALISMAN
		02/11-33-075-05W4/0	363.5	366.0	Wbsk C Sand	TALISMAN
		02/11-33-075-05W4/0	366.0	369.5	Wbsk D Valley Fill	TALISMAN
		00/04-34-075-05W4/0	370.2	371.3	McM A1 Seq	TALISMAN
		02/04-34-075-05W4/0	370.2	371.3	Wbsk D Valley Fill	TALISMAN
		00/12-26-075-06W4/0	350.8	353.0	Wbsk D Valley Fill	DEVON
		AA/01-35-075-06W4/0	353.0	355.1	Wbsk D Valley Fill	ENCANA C.
		AA/03-35-075-06W4/0	346.1	349.0	Wbsk D Valley Fill	ENCANA C.
		00/06-36-075-06W4/0	356.5	357.0	Wbsk C Sand	DEVON
		00/06-36-075-06W4/0	357.0	359.5	Wbsk D Valley Fill	DEVON
		00/11-04-076-05W4/0	359.5	360.5	Wbsk C Sand	PET
		00/11-04-076-05W4/0	361.3	366.7	McM Channel	PET
		00/10-05-076-05W4/0	363.6	366.0	Wbsk C Sand	PET
		00/10-05-076-05W4/0	366.4	371.3	McM Channel	PET
		00/04-01-076-06W4/0	358.3	359.5	Wbsk C Sand	DEVON
		00/04-01-076-06W4/0	359.5	367.0	Wbsk D Valley Fill	DEVON
		AA/02-02-076-06W4/0	360.0	361.0	Wbsk C Sand	ENCANA C.
		AA/02-02-076-06W4/0	362.0	362.7	Wbsk D Valley Fill	ENCANA C.
		AA/04-02-076-06W4/0	356.0	357.0	Wbsk C Sand	ENCANA C.
		00/15-02-076-06W4/0	337.0	339.8	Wbsk D Valley Fill	CNRL
		00/04-03-076-06W4/0	351.5	353.0	Wbsk C Sand	DEVON
		AA/06-03-076-06W4/0	350.5	351.5	Wbsk C Sand	ENCANA C.
LEISMER	MCMURRAY A3A	00/02-17-078-08W4/0	320.0	323.0	McM Channel	PET
	MCMURRAY AA	00/11-04-080-09W4/0	434.3	440.0	McM B1 Seq	EnCana
		00/11-04-080-09W4/0	440.0	447.0	McM B2 Seq	EnCana
		00/07-05-080-09W4/0	440.0	448.0	McM B1 Seq	ENCANA
		00/06-06-080-09W4/0	439.0	449.0	McM Channel	ENCANA C.
		00/11-07-080-09W4/0	437.0	446.2	McM Channel	ENCANA
	MCMURRAY B3B	00/10-06-077-10W4/0	449.0	452.6	McM Channel	PET
	MCMURRAY EEE	00/10-22-077-11W4/0	470.0	472.4	McM Channel	PET
	MCMURRAY I4I	00/09-18-079-07W4/0	310.5	315.2	McM B1 Channel	CNRL
		00/09-19-079-07W4/0	312.0	317.0	McM B1 Channel	CNRL
		00/04-30-079-07W4/0	323.5	329.0	McM Channel	ENCANA C.
		00/11-24-079-08W4/0	320.8	325.5	McM B1 Seq	CNRL
	MCMURRAY J4J	00/05-20-079-07W4/0	310.8	316.5	McM B1 Channel	CNRL
	MCMURRAY K2K	00/08-16-078-10W4/0	392.5	393.0	McM A1 Seq	PET
		00/05-20-078-10W4/0	414.0	416.0	McM A1 Seq	PET
		00/06-21-078-10W4/0	402.0	402.7	McM A1 Seq	PET
	MCMURRAY NN	00/11-15-077-11W4/0	448.5	458.2	McM Channel	PET
	MCMURRAY OO	00/09-07-077-10W4/0	460.8	464.5	McM Channel	PET
		00/09-12-077-11W4/0	450.5	457.0	McM Channel	PET
		00/09-13-077-11W4/0	467.4	468.0	McM Channel	PET
	MCMURRAY P	00/07-29-078-09W4/0	419.0	421.0	McM C Channel	ENCANA C.
	MCMURRAY P2P	00/09-13-077-11W4/0	461.7	462.6	McM B1 Seq	PET
	MCMURRAY Q	00/03-20-079-08W4/0	375.0	378.5	McM C Channel	ENCANA C.
		00/08-13-079-09W4/0	383.0	384.5	McM C Channel	ENCANA C.
	MCMURRAY QQ	00/06-14-079-10W4/0	391.8	401.0	McM Channel	PET
		00/07-14-079-10W4/0	392.3	400.0	McM Channel	PET
		00/08-15-079-10W4/0	421.0	421.8	McM Channel	PET
	MCMURRAY SS	00/05-27-077-11W4/0	460.0	465.0	McM B1 Seq	PET
	MCMURRAY TT	00/06-35-077-11W4/0	461.3	464.3	McM Channel	PET
	MCMURRAY U/D-325	00/12-09-079-10W4/0	423.0	424.0	McM Channel	PET
	MCMURRAY U/D-386	00/16-03-080-08W4/0	385.0	387.0	McM C Channel	NORTHSTAR
	MCMURRAY UNDEFINED 1	AA/03-04-076-06W4/0	363.0	364.0	McM B1 Seq	DEVON ARL
	MCMURRAY UNDEFINED 2	AA/11-23-077-06W4/0	326.0	328.0	McM Channel	MEG
	MCMURRAY V3V	00/05-33-078-10W4/0	404.0	408.6	McM B1 Seq	PET
		00/12-03-079-10W4/0	417.3	418.0	McM B1 Seq	PET
		00/12-09-079-10W4/0	417.0	418.3	McM B1 Seq	PET
		00/02-16-079-10W4/0	428.5	429.0	McM B1 Seq	PET
	MCMURRAY X	00/09-32-079-09W4/0	452.0	453.0	McM C Channel	ENCANA C.
	MCMURRAY Y3Y	00/06-07-079-09W4/0	397.0	402.5	McM Channel	ENCANA
		00/06-18-079-09W4/0	412.2	413.8	McM Channel	ENCANA

Table 1. Wabiskaw-McMurray Intervals Denied For Gas Production

Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
LEISMER (cont.)	MCMURRAY Y3Y (cont.)	00/03-24-079-10W4/0	425.0	425.5	McM B1 Seq	ENCANA C.
		00/03-24-079-10W4/0	430.0	431.0	McM B1 Seq	ENCANA C.
	MCMURRAY Z2Z	00/03-09-078-08W4/0	315.1	318.2	McM Channel	PET
		00/03-14-078-08W4/0	302.9	305.0	McM A2 Seq	PET
		00/05-15-078-08W4/0	299.0	302.0	McM Channel	PET
		00/12-22-078-08W4/0	312.0	313.0	McM Channel	PET
		00/11-23-078-08W4/0	296.4	299.0	McM A2 Seq	PET
		00/06-28-078-08W4/0	312.6	313.0	McM Channel	PET
	WABISKAW K	00/10-27-078-09W4/0	367.6	368.8	Wbsk C Sand	PARAMOUNT
		00/16-28-078-09W4/0	377.0	378.0	Wbsk C Sand	PET
		00/07-29-078-09W4/0	392.0	393.0	Wbsk C Sand	ENCANA C.
		00/07-32-078-09W4/0	400.6	401.0	Wbsk C Sand	ENCANA
	WABISKAW U/D-086	00/06-08-078-10W4/0	411.0	412.0	Wbsk C Sand	PET
	WABISKAW-MCMURRAY A	00/11-17-077-07W4/0	299.6	302.2	Wbsk C Sand	DEVON
		00/06-20-077-07W4/0	301.8	305.5	Wbsk C Sand	DEVON
		AA/14-27-077-07W4/0	290.3	291.0	Wbsk C Sand	NEXEN
		00/10-29-077-07W4/0	292.0	293.5	Wbsk C Sand	DEVON
		00/06-30-077-07W4/0	290.8	292.5	Wbsk C Sand	DEVON ARL
		AA/02-31-077-07W4/0	289.8	291.0	Wbsk C Sand	NEXEN
		00/07-32-077-07W4/0	286.7	289.2	Wbsk C Sand	DEVON ARL
		AA/15-32-077-07W4/0	291.0	292.0	Wbsk C Sand	NEXEN
		00/16-32-077-07W4/0	292.8	295.4	Wbsk C Sand	DEVON ARL
		AA/06-34-077-07W4/0	296.2	297.2	Wbsk C Sand	NEXEN
		00/08-34-077-07W4/0	294.6	295.8	Wbsk C Sand	BP
		00/09-34-077-08W4/0	300.0	302.4	Wbsk C Sand	BP
		00/11-36-077-08W4/0	296.2	297.5	Wbsk C Sand	BP
		00/11-02-078-07W4/0	298.9	300.0	Wbsk C Sand	DEVON
		00/06-03-078-07W4/0	287.0	288.5	Wbsk C Sand	DEVON
		00/07-04-078-07W4/0	289.0	291.0	Wbsk C Sand	BP
		00/06-05-078-07W4/0	276.4	280.0	Wbsk C Sand	BP
		00/08-05-078-07W4/0	286.8	289.5	Wbsk C Sand	BP
		00/09-07-078-07W4/0	291.0	293.0	Wbsk C Sand	BP
		00/11-07-078-07W4/0	294.2	295.0	Wbsk C Sand	BP
		00/16-09-078-07W4/0	282.2	283.5	Wbsk C Sand	BP
		00/08-10-078-07W4/0	272.0	273.8	Wbsk C Sand	DEVON
		00/05-15-078-07W4/0	268.2	269.5	Wbsk C Sand	DEVON
		00/06-16-078-07W4/0	280.1	281.6	Wbsk C Sand	BP
		00/11-17-078-07W4/0	277.4	278.1	Wbsk C Sand	BP
		00/10-19-078-07W4/0	283.0	284.0	Wbsk C Sand	DEVON
		00/10-20-078-07W4/0	280.0	281.0	Wbsk C Sand	DEVON
		00/12-21-078-07W4/0	260.0	260.4	Wbsk C Sand	DEVON ARL
		00/05-22-078-07W4/0	242.8	244.1	Wbsk C Sand	CNRL
		00/11-23-078-07W4/0	269.0	270.0	Wbsk C Sand	DEVON ARL
		00/15-26-078-07W4/0	272.1	273.0	Wbsk C Sand	CNRL
		00/15-26-078-07W4/0	274.0	278.8	McM A2 Seq	CNRL
		00/10-27-078-07W4/0	284.0	285.5	Wbsk C Sand	CNRL
		00/13-27-078-07W4/0	283.0	284.5	Wbsk C Sand	CNRL
		00/07-28-078-07W4/0	289.3	290.2	Wbsk C Sand	DEVON
		00/07-29-078-07W4/0	281.5	282.5	Wbsk C Sand	DEVON
		00/06-30-078-07W4/0	286.5	289.5	Wbsk C Sand	DEVON
		00/12-31-078-07W4/0	288.6	289.2	Wbsk C Sand	DEVON ARL
		00/05-34-078-07W4/0	282.0	283.5	Wbsk C Sand	CNRL
		00/05-34-078-07W4/0	284.0	285.5	Wbsk D Valley Fill	CNRL
		00/11-34-078-07W4/0	282.0	282.8	Wbsk C Sand	CNRL
		00/16-34-078-07W4/0	281.0	282.8	Wbsk C Sand	CNRL
		00/16-34-078-07W4/0	283.0	286.5	McM A2 Seq	CNRL
		00/07-35-078-07W4/0	277.0	277.7	Wbsk C Sand	CNRL
		00/07-35-078-07W4/0	279.2	281.9	McM A2 Seq	CNRL
		00/06-36-078-07W4/0	266.7	267.5	Wbsk C Sand	CNRL
		00/06-36-078-07W4/0	268.0	277.0	McM A2 Seq	CNRL
		00/13-36-078-07W4/0	287.5	288.3	Wbsk C Sand	CNRL
		00/13-36-078-07W4/0	289.0	290.5	McM A2 Seq	CNRL
		00/03-03-078-08W4/0	295.5	298.5	Wbsk C Sand	BP
		00/03-09-078-08W4/0	310.8	312.7	Wbsk C Sand	PET
		00/10-12-078-08W4/0	292.3	294.5	Wbsk C Sand	PET

Table 1. Wabiskaw-McMurray Intervals Denied For Gas Production

Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
LEISMER (cont.)	WABISKAW-MCMURRAY A (cont.)	00/03-14-078-08W4/0	299.0	302.0	Wbsk C Sand	PET
		00/05-15-078-08W4/0	296.1	298.0	Wbsk C Sand	PET
		00/02-16-078-08W4/0	295.0	298.0	Wbsk C Sand	PET
		00/02-17-078-08W4/0	316.2	318.5	Wbsk C Sand	PET
		00/15-20-078-08W4/0	307.8	309.0	Wbsk C Sand	PET
		00/10-21-078-08W4/0	306.2	307.3	Wbsk C Sand	PET
		00/12-22-078-08W4/0	309.0	311.0	Wbsk C Sand	PET
		00/11-23-078-08W4/0	293.8	295.5	Wbsk C Sand	PET
		00/11-26-078-08W4/0	293.0	294.4	Wbsk C Sand	PET
		00/09-27-078-08W4/0	289.5	291.2	Wbsk C Sand	PET
		00/06-28-078-08W4/0	306.0	309.0	Wbsk C Sand	PET
		00/08-29-078-08W4/0	310.3	313.0	Wbsk C Sand	PET
		00/09-34-078-08W4/0	296.1	297.6	Wbsk C Sand	PET
		00/11-36-078-08W4/0	295.4	297.0	Wbsk C Sand	PET
		00/11-06-079-06W4/0	290.0	291.0	Wbsk C Sand	CNRL
		00/11-06-079-06W4/0	292.0	296.8	McM A2 Seq	CNRL
		00/12-31-079-06W4/0	288.2	289.2	Wbsk C Sand	CNRL
		00/13-01-079-07W4/0	287.0	288.0	Wbsk C Sand	CNRL
		00/13-01-079-07W4/0	289.0	293.5	McM A2 Seq	CNRL
		00/13-01-079-07W4/0	289.0	293.5	McM A2 Seq	CNRL
		02/13-01-079-07W4/0	288.0	289.0	Wbsk C Sand	CNRL
		02/13-01-079-07W4/0	290.0	296.0	McM A2 Seq	CNRL
		00/11-03-079-07W4/0	286.8	288.0	Wbsk C Sand	CNRL
		00/11-03-079-07W4/0	289.0	290.5	McM A Channel	CNRL
		00/01-04-079-07W4/0	286.8	288.0	Wbsk C Sand	CNRL
		00/05-04-079-07W4/0	290.0	291.2	Wbsk C Sand	CNRL
		00/10-05-079-07W4/0	294.4	295.0	Wbsk C Sand	CNRL
		00/12-05-079-07W4/0	297.0	298.2	Wbsk C Sand	CNRL
		02/09-06-079-07W4/0	291.8	293.2	Wbsk C Sand	CNRL
		02/09-06-079-07W4/0	294.5	296.0	McM A Channel	CNRL
		00/10-06-079-07W4/0	287.2	289.2	Wbsk C Sand	PET
		00/09-07-079-07W4/0	291.8	293.0	Wbsk C Sand	CNRL
		00/09-07-079-07W4/0	294.0	296.0	McM A1 Seq	CNRL
		00/11-08-079-07W4/0	296.0	297.0	Wbsk C Sand	CNRL
		00/11-08-079-07W4/0	298.5	300.2	McM A1 Seq	CNRL
		00/03-09-079-07W4/0	301.0	302.7	Wbsk C Sand	CNRL
		00/03-09-079-07W4/0	303.5	306.0	McM A Channel	CNRL
		00/02-10-079-07W4/0	286.8	288.0	Wbsk C Sand	CNRL
		00/02-10-079-07W4/0	289.0	290.0	McM A1 Seq	CNRL
		00/02-10-079-07W4/0	290.0	293.0	McM A2 Seq	CNRL
		00/10-10-079-07W4/0	291.0	293.0	Wbsk C Sand	CNRL
		00/10-11-079-07W4/0	282.7	283.5	Wbsk C Sand	CNRL
		00/10-11-079-07W4/0	285.0	288.8	McM A2 Seq	CNRL
		00/09-12-079-07W4/0	282.7	283.7	Wbsk C Sand	CNRL
		00/09-12-079-07W4/0	284.3	289.0	McM A Channel	CNRL
		00/10-12-079-07W4/0	281.3	281.9	Wbsk C Sand	CNRL
		00/10-12-079-07W4/0	283.0	287.2	McM A Channel	CNRL
		00/04-13-079-07W4/0	283.0	284.0	Wbsk C Sand	CNRL
		00/04-13-079-07W4/0	284.8	287.0	McM A1 Seq	CNRL
		00/04-13-079-07W4/0	287.0	289.0	McM A2 Seq	CNRL
		00/11-13-079-07W4/0	269.0	270.0	Wbsk C Sand	CNRL
		00/11-13-079-07W4/0	271.0	275.5	McM A Channel	CNRL
		AA/10-14-079-07W4/0	295.4	296.0	Wbsk C Sand	PETRO-CANADA
		AA/10-14-079-07W4/0	297.7	299.5	McM A2 Seq	PETRO-CANADA
		00/01-15-079-07W4/0	292.8	294.5	Wbsk C Sand	CNRL
		00/01-15-079-07W4/0	295.5	299.0	McM A Channel	CNRL
		00/06-15-079-07W4/0	305.0	309.0	McM A Channel	CNRL
		00/13-16-079-07W4/0	307.0	310.5	McM A Channel	CNRL
		00/12-17-079-07W4/0	301.0	303.0	McM A1 Seq	CNRL
		00/03-18-079-07W4/0	301.0	301.2	Wbsk C Sand	CNRL
		00/09-18-079-07W4/0	299.0	300.2	Wbsk C Sand	CNRL
		00/09-18-079-07W4/0	301.3	304.5	McM A Channel	CNRL
		00/09-19-079-07W4/0	301.2	302.5	Wbsk C Sand	CNRL
		00/09-19-079-07W4/0	304.7	306.5	McM A1 Seq	CNRL
		00/05-20-079-07W4/0	300.0	301.0	Wbsk C Sand	CNRL

Table 1. Wabiskaw-McMurray Intervals Denied For Gas Production

Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
LEISMER (cont.)	WABISKAW-MCMURRAY A (cont.)	00/05-20-079-07W4/0	302.2	304.5	McM A1 Seq	CNRL
		00/04-21-079-07W4/0	308.2	309.0	Wbsk C Sand	CNRL
		00/04-21-079-07W4/0	310.3	314.0	McM A Channel	CNRL
		00/07-21-079-07W4/0	313.2	315.0	McM A1 Seq	CNRL
		00/12-22-079-07W4/0	312.0	312.6	Wbsk C Sand	CNRL
		00/12-22-079-07W4/0	314.0	316.7	McM A1 Seq	CNRL
		00/10-25-079-07W4/0	295.3	296.2	Wbsk C Sand	CNRL
		00/04-27-079-07W4/0	304.2	305.2	Wbsk C Sand	CNRL
		00/04-27-079-07W4/0	306.5	308.0	McM A1 Seq	CNRL
		02/04-28-079-07W4/0	307.0	308.0	Wbsk C Sand	CNRL
		00/04-30-079-07W4/0	313.0	314.5	Wbsk C Sand	ENCANA C.
		00/04-30-079-07W4/0	316.0	317.8	McM A1 Seq	ENCANA C.
		00/11-33-079-07W4/0	318.0	319.8	Wbsk C Sand	CNRL
		00/11-33-079-07W4/0	320.5	321.8	McM A1 Seq	CNRL
		00/12-35-079-07W4/0	304.7	305.2	Wbsk C Sand	CNRL
		00/12-36-079-07W4/0	288.2	289.0	Wbsk C Sand	CNRL
		00/10-01-079-08W4/0	295.0	296.0	Wbsk C Sand	CNRL
		00/10-01-079-08W4/0	298.0	299.6	McM A2 Seq	CNRL
		00/10-02-079-08W4/0	299.8	301.0	Wbsk C Sand	CNRL
		00/10-02-079-08W4/0	302.2	303.8	McM A2 Seq	CNRL
		00/07-03-079-08W4/0	307.0	309.0	Wbsk C Sand	PET
		00/04-10-079-08W4/0	320.0	321.5	Wbsk C Sand	CNRL
		00/11-11-079-08W4/0	306.0	308.0	Wbsk C Sand	PET
		00/10-12-079-08W4/0	297.5	298.4	Wbsk C Sand	PET
		00/09-13-079-08W4/0	299.0	300.0	Wbsk C Sand	CNRL
		00/13-13-079-08W4/0	307.5	308.5	Wbsk C Sand	CNRL
		00/01-14-079-08W4/0	305.0	306.2	Wbsk C Sand	CNRL
		00/12-14-079-08W4/0	321.0	322.0	Wbsk C Sand	PRIMEWEST
		00/11-15-079-08W4/0	335.0	336.5	Wbsk C Sand	CNRL
		00/13-15-079-08W4/0	336.3	338.0	Wbsk C Sand	CNRL
		00/11-16-079-08W4/0	341.3	342.0	Wbsk C Sand	CNRL
		00/03-20-079-08W4/0	346.0	346.8	Wbsk C Sand	ENCANA C.
		00/01-21-079-08W4/0	334.0	335.0	Wbsk C Sand	CNRL
		00/03-22-079-08W4/0	331.5	333.0	Wbsk C Sand	CNRL
		00/16-22-079-08W4/2	346.2	348.0	Wbsk C Sand	CNRL
		00/12-23-079-08W4/2	332.6	333.3	Wbsk C Sand	CNRL
		00/11-24-079-08W4/2	309.8	312.7	Wbsk C Sand	CNRL
		00/01-26-079-08W4/0	338.0	339.5	Wbsk C Sand	EnCana C.
		00/03-28-079-08W4/0	352.0	353.0	Wbsk C Sand	ENCANA C.
		00/04-29-079-08W4/0	372.5	374.0	Wbsk C Sand	EnCana
		00/10-36-079-08W4/0	332.6	334.6	Wbsk C Sand	EnCana C.
		00/07-06-080-06W4/0	288.3	290.0	Wbsk C Sand	CNRL
		00/06-02-080-07W4/0	306.3	308.5	Wbsk C Sand	PETRO-CANADA
		00/11-06-080-07W4/0	337.0	339.0	Wbsk C Sand	NORTHSTAR
		00/14-12-080-08W4/0	356.5	358.5	Wbsk C Sand	PET
	WABISKAW-MCMURRAY B	00/11-16-076-06W4/0	319.0	323.0	Wbsk D Valley Fill	Devon
	WABISKAW-MCMURRAY C	00/06-07-079-09W4/0	392.0	393.8	Wbsk C Sand	ENCANA
		00/06-07-079-09W4/0	393.8	395.5	McM A1 Seq	ENCANA
		00/08-08-079-09W4/0	398.5	400.5	McM A1 Seq	ENCANA C.
		00/08-08-079-09W4/0	400.5	406.0	McM Channel	ENCANA C.
		00/11-16-079-09W4/0	413.5	415.0	Wbsk C Sand	ENCANA C.
		00/11-16-079-09W4/0	415.3	417.4	McM A1 Seq	ENCANA C.
		02/11-16-079-09W4/0	414.0	415.0	Wbsk C Sand	PET
		02/11-16-079-09W4/0	415.3	417.0	McM A1 Seq	PET
		00/12-16-079-09W4/0	418.3	421.0	McM A1 Seq	PET
		00/05-17-079-09W4/0	397.7	401.0	McM A1 Seq	ENCANA C.
		00/05-17-079-09W4/0	401.0	406.2	McM Channel	ENCANA C.
		00/06-18-079-09W4/0	401.0	401.7	Wbsk C Sand	ENCANA
		00/06-18-079-09W4/0	401.7	403.1	McM A1 Seq	ENCANA
		00/08-19-079-09W4/0	410.5	413.5	McM A1 Seq	ENCANA C.
		00/08-19-079-09W4/0	417.0	420.0	McM Channel	ENCANA C.
		00/09-21-079-09W4/0	411.3	412.5	Wbsk C Sand	EnCana
		00/09-21-079-09W4/0	412.5	413.3	McM A1 Seq	EnCana
		00/07-10-079-10W4/0	407.6	408.5	McM A1 Seq	PET
		00/10-12-079-10W4/0	393.0	394.0	McM A1 Seq	ENCANA

Table 1. Wabiskaw-McMurray Intervals Denied For Gas Production

Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
LEISMER (cont.)	WABISKAW-MCMURRAY C (cont.)	00/07-13-079-10W4/0	409.0	410.2	McM A1 Seq	ENCANA C.
		00/06-14-079-10W4/0	384.0	387.5	McM A1 Seq	PET
		00/07-14-079-10W4/0	384.0	388.0	McM A1 Seq	PET
		00/08-15-079-10W4/0	409.8	410.8	McM A1 Seq	PET
		00/02-16-079-10W4/0	421.6	424.0	McM A1 Seq	PET
		00/06-23-079-10W4/0	409.0	412.0	McM A1 Seq	PET
		00/03-24-079-10W4/0	416.0	419.0	McM A1 Seq	ENCANA C.
		00/12-25-079-10W4/0	432.0	435.0	McM A1 Seq	ENCANA C.
		00/15-26-079-10W4/0	432.5	434.0	McM A1 Seq	PET
		00/06-35-079-10W4/0	433.5	435.0	McM A1 Seq	PET
	WABISKAW-MCMURRAY D	AA/12-13-077-08W4/0	301.5	303.0	Wbsk C Sand	NEXEN
		00/14-13-077-08W4/0	301.2	302.4	Wbsk C Sand	BP
		00/07-14-077-08W4/0	312.0	313.0	Wbsk C Sand	BP
		00/07-14-077-08W4/0	314.3	315.3	McM A Channel	BP
		00/09-15-077-08W4/0	308.0	310.0	Wbsk C Sand	BP
		00/10-16-077-08W4/0	302.7	303.8	Wbsk C Sand	BP
		00/12-21-077-08W4/0	310.4	311.5	Wbsk C Sand	BP
		00/06-22-077-08W4/0	300.0	301.2	Wbsk C Sand	BP
		00/02-23-077-08W4/0	313.2	314.5	Wbsk C Sand	BP
		00/02-23-077-08W4/0	315.5	316.2	McM A1 Seq	BP
		00/04-23-077-08W4/0	308.0	309.0	Wbsk C Sand	BP
		AA/06-23-077-08W4/0	300.0	301.1	Wbsk C Sand	NEXEN
		00/06-24-077-08W4/0	300.0	301.2	Wbsk C Sand	BP
		AA/14-24-077-08W4/0	300.0	301.0	Wbsk C Sand	NEXEN
		00/07-26-077-08W4/0	293.5	295.0	Wbsk C Sand	BP
		AA/07-26-077-08W4/0	294.2	295.6	Wbsk C Sand	PETRO-CANADA
	WABISKAW-MCMURRAY E	00/10-26-079-09W4/0	413.0	414.5	McM A1 Seq	ENCANA
		00/11-27-079-09W4/0	410.0	411.8	McM A1 Seq	ENCANA C.
		00/10-28-079-09W4/0	409.0	410.0	Wbsk C Sand	EnCana
		00/10-28-079-09W4/0	412.2	413.0	McM A2 Seq	EnCana
		00/10-28-079-09W4/1	410.0	410.8	McM A1 Seq	EnCana
		00/01-29-079-09W4/0	415.0	417.0	McM A1 Seq	ENCANA
		00/09-32-079-09W4/0	428.0	430.0	McM A1 Seq	ENCANA C.
		00/06-34-079-09W4/0	410.0	411.5	McM A1 Seq	ENCANA C.
		00/06-34-079-09W4/0	412.2	412.5	McM A2 Seq	ENCANA C.
		00/10-35-079-09W4/0	407.1	408.5	McM A1 Seq	ENCANA C.
		00/11-04-080-09W4/0	426.5	428.0	McM A1 Seq	EnCana
		00/11-04-080-09W4/0	428.0	429.5	McM A2 Seq	EnCana
		00/11-07-080-09W4/0	434.0	436.0	McM A1 Seq	ENCANA
		00/06-08-080-09W4/0	437.1	438.0	McM A1 Seq	CNRL
		00/12-16-080-09W4/0	432.0	433.5	McM A1 Seq	EnCana
		00/12-16-080-09W4/0	433.5	434.0	McM A2 Seq	EnCana
		00/12-17-080-09W4/0	430.0	431.5	McM A1 Seq	ENCANA
		00/12-17-080-09W4/0	436.5	437.0	McM Channel	ENCANA
		00/08-20-080-09W4/0	429.3	431.2	McM A1 Seq	ENCANA C.
		00/08-20-080-09W4/0	431.2	433.0	McM Channel	ENCANA C.
		00/08-29-080-09W4/0	425.0	427.0	McM A1 Seq	ENCANA C.
		00/08-29-080-09W4/0	427.0	429.0	McM Channel	ENCANA C.
LIEGE	WABISKAW U/D-051	00/11-09-096-17W4/0	455.0	456.0	Wbsk C Sand	PET
NEWBY	MCMURRAY C2C	00/15-07-082-05W4/0	209.5	219.0	McM Channel	PET
		00/02-18-082-05W4/0	207.0	221.0	McM Channel	PET
	MCMURRAY ZZZ	00/11-03-082-05W4/0	200.0	208.0	McM Channel	CNRL
		00/10-04-082-05W4/0	203.0	213.5	McM Channel	PET
		00/07-05-082-05W4/0	216.0	221.0	McM Channel	PET
		00/02-08-082-05W4/0	208.0	220.0	McM Channel	PET
		00/07-09-082-05W4/0	187.0	208.5	McM Channel	PET
		00/02-10-082-05W4/0	205.0	209.0	McM Channel	CNRL
	WABISKAW N	00/14-11-084-06W4/0	244.0	244.8	Wbsk D Valley Fill	PET
	WABISKAW S	00/01-02-084-06W4/0	266.5	268.0	Wbsk C Sand	PET
		00/05-07-084-05W4/0	190.5	192.1	Wbsk C Sand	CNRL
		00/08-12-084-06W4/0	212.0	213.0	Wbsk C Sand	CNRL
		00/02-01-084-06W4/0	228.3	229.0	Wbsk C Sand	CNRL
		00/10-01-084-06W4/0	230.0	231.7	Wbsk C Sand	CNRL
		00/15-02-084-06W4/0	267.2	268.2	Wbsk C Sand	PARAMOUNT
	WABISKAW T	00/06-09-084-06W4/0	236.3	237.5	Wbsk C Sand	CNRL

Table 1. Wabiskaw-McMurray Intervals Denied For Gas Production

Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
NEWBY (cont.)	WABISKAW T (cont.)	00/05-10-084-06W4/0	219.3	221.0	Wbsk C Sand	CNRL
		00/07-16-084-06W4/0	206.0	207.0	Wbsk C Sand	CNRL
		00/09-17-084-06W4/0	210.2	211.0	Wbsk C Sand	CNRL
		00/10-20-084-06W4/0	214.2	214.8	Wbsk C Sand	CNRL
		00/10-21-084-06W4/0	194.5	196.0	Wbsk C Sand	CNRL
	WABISKAW U/D-050	AA/02-11-086-07W4/0	183.0	184.8	Wbsk C Sand	NEXEN
	WABISKAW U/D-052	AA/06-23-086-07W4/0	173.8	176.0	Wbsk C Sand	OPTI
		AA/11-23-086-07W4/0	171.0	172.5	Wbsk C Sand	OPTI
		AA/07-26-086-07W4/0	162.0	163.9	Wbsk C Sand	OPTI
	WABISKAW U/D-053	AA/06-28-086-07W4/0	185.3	186.7	Wbsk C Sand	CANNAT
	WABISKAW U/D-055	AA/07-33-086-07W4/0	169.0	170.5	Wbsk C Sand	CANNAT
	WABISKAW U/D-060	00/15-31-083-05W4/0	223.0	223.7	Wbsk C Sand	CNRL
		00/12-05-084-05W4/0	223.4	224.5	Wbsk C Sand	CNRL
	WABISKAW U/D-063	00/14-11-084-06W4/0	241.6	243.0	Wbsk C Sand	PET
	WABISKAW U/D-075	00/15-17-085-06W4/0	170.5	171.5	Wbsk C Sand	CNRL
	WABISKAW U/D-081	AA/11-01-086-07W4/0	174.6	177.0	Wbsk C Sand	SUNCOR
	WABISKAW V	00/10-25-085-06W4/0	163.2	164.5	Wbsk C Sand	CNRL
		00/10-26-085-06W4/0	154.2	155.0	Wbsk C Sand	CNRL
		00/10-27-085-06W4/0	168.0	169.6	Wbsk C Sand	CNRL
	WABISKAW Y	00/12-14-084-06W4/0	203.0	204.0	Wbsk C Sand	PET
	WABISKAW-MCMURRAY J	00/06-09-084-06W4/0	239.7	240.0	Wbsk D Valley Fill	CNRL
		00/06-09-084-06W4/0	240.4	241.5	McM A1 Seq	CNRL
		00/06-09-084-06W4/0	243.0	250.0	McM Channel	CNRL
		00/05-10-084-06W4/0	222.0	222.7	Wbsk D Valley Fill	CNRL
		00/05-10-084-06W4/0	223.8	224.8	McM A1 Seq	CNRL
		00/05-10-084-06W4/0	225.0	231.0	McM Channel	CNRL
		00/12-14-084-06W4/0	207.0	209.0	McM Channel	PET
		00/12-14-084-06W4/0	205.5	206.1	Wbsk D Valley Fill	PET
		00/07-16-084-06W4/0	211.0	211.9	McM A1 Seq	CNRL
		00/07-16-084-06W4/0	213.7	222.7	McM Channel	CNRL
		00/09-17-084-06W4/0	213.0	213.7	Wbsk D Valley Fill	CNRL
		00/09-17-084-06W4/0	214.3	215.8	McM A1 Seq	CNRL
		00/09-17-084-06W4/0	217.3	225.0	McM Channel	CNRL
		00/10-20-084-06W4/0	217.8	219.2	McM A1 Seq	CNRL
		00/10-21-084-06W4/0	197.4	198.1	Wbsk D Valley Fill	CNRL
		00/10-21-084-06W4/0	198.5	209.0	McM Channel	CNRL
RESDELN	MCMURRAY JJ	00/06-12-084-07W4/0	297.5	304.0	McM B1 Seq	PET
	MCMURRAY PP	00/03-18-084-06W4/0	303.0	310.0	McM Channel	PET
	MCMURRAY RR	00/03-13-084-07W4/0	273.0	274.8	McM A1 Seq	PET
		00/10-24-084-07W4/0	253.5	255.5	McM A1 Seq	PET
	MCMURRAY U/D-060	00/03-18-084-06W4/0	318.5	319.3	McM Channel	PET
	MCMURRAY U/D-061	00/03-13-084-07W4/0	290.5	291.2	McM Channel	PET
	MCMURRAY U/D-073	00/06-12-084-07W4/0	308.3	314.7	McM Channel	PET
	WABISKAW U/D-012	00/05-07-084-06W4/0	305.0	306.0	Wbsk C Sand	PARAMOUNT
	WABISKAW U/D-013	00/03-18-084-06W4/0	292.4	293.5	Wbsk C Sand	PET
	WABISKAW-MCMURRAY A	00/05-07-084-06W4/0	307.8	308.5	Wbsk D Valley Fill	PARAMOUNT
		00/05-07-084-06W4/0	309.0	310.7	McM A1 Seq	PARAMOUNT
		00/05-07-084-06W4/0	311.8	322.0	McM Channel	PARAMOUNT
		00/03-18-084-06W4/0	296.2	298.0	McM A1 Seq	PET
		00/03-13-084-07W4/0	272.0	272.5	Wbsk D Valley Fill	PET
		00/03-13-084-07W4/0	275.9	284.0	McM Channel	PET
TAR	MCMURRAY U/D-035	00/12-28-099-14W4/0	521.0	523.2	McM Channel	ENCANA
	MCMURRAY U/D-036	00/03-14-099-14W4/0	524.5	525.5	McM Channel	ENCANA
	WABISKAW K	00/12-28-099-14W4/0	512.0	517.0	Wbsk C Sand	ENCANA
	WABISKAW O	00/11-23-098-14W4/0	551.0	553.0	Wbsk C Sand	ENCANA
		00/03-35-098-14W4/0	537.3	539.6	Wbsk C Sand	ENCANA
		00/01-01-099-14W4/0	532.0	535.0	Wbsk C Sand	ENCANA
		AA/07-01-099-14W4/0	538.8	540.7	Wbsk C Sand	IMPERIAL
	WABISKAW P	00/05-33-098-14W4/0	528.0	529.7	Wbsk C Sand	ENCANA
		00/09-03-099-14W4/0	522.7	525.8	Wbsk C Sand	ENCANA
		00/11-07-099-14W4/0	472.0	472.6	Wbsk C Sand	ENCANA
		00/02-08-099-14W4/0	501.0	505.6	Wbsk C Sand	ENCANA
		AA/07-09-099-14W4/0	511.3	512.0	Wbsk C Sand	IMPERIAL
		00/09-17-099-14W4/0	511.6	515.0	Wbsk C Sand	ENCANA
	WABISKAW S	00/11-07-099-14W4/0	474.5	478.1	Wbsk C Sand	ENCANA

Table 1. Wabiskaw-McMurray Intervals Denied For Gas Production

Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
TAR (cont.)	WABISKAW S (cont.)	AA/12-12-099-15W4/0	457.8	459.3	Wbsk C Sand	IMPERIAL
	WABISKAW U/D-018	00/09-14-099-15W4/0	474.5	478.0	Wbsk C Sand	ENCANA
	WABISKAW U/D-022	00/14-35-100-13W4/0	499.0	503.0	Wbsk D Sand	ENCANA
	WABISKAW U/D-033	00/15-17-099-13W4/0	536.0	538.4	Wbsk C Sand	ENCANA
THORNBURY	MCMURRAY E5E	00/15-22-079-10W4/0	423.5	425.0	McM A1 Seq	PET
		00/15-22-079-10W4/0	430.0	430.5	McM Channel	PET
		00/06-23-079-10W4/0	420.5	421.0	McM Channel	PET
		00/13-27-079-10W4/0	410.0	412.5	McM A1 Seq	PET
		00/13-27-079-10W4/0	412.5	419.0	McM Channel	PET
		00/10-28-079-10W4/0	402.5	406.0	McM A1 Seq	PET
		00/10-29-079-10W4/0	407.5	409.0	McM A1 Seq	CNRL
	MCMURRAY M5M	00/11-27-079-11W4/0	434.0	436.0	McM B1 Seq	CNRL
	MCMURRAY R5R	00/10-12-080-12W4/0	441.0	443.0	McM Channel	CNRL
	MCMURRAY U/D-240	00/10-05-080-12W4/0	444.0	466.0	McM Channel	SUPERMAN
	MCMURRAY W4W	00/11-22-079-11W4/0	434.5	437.0	McM Channel	CNRL
	MCMURRAY X4X	00/09-20-079-11W4/0	432.0	435.2	McM Channel	CNRL
		00/10-17-079-11W4/0	434.0	435.5	McM Channel	CNRL
		00/13-15-079-11W4/0	436.4	441.0	McM Channel	CNRL
		00/15-16-079-11W4/0	437.6	442.0	McM Channel	CNRL
		00/12-14-079-11W4/0	438.0	439.0	McM Channel	CNRL
		00/11-09-079-11W4/0	446.2	447.4	McM Channel	CNRL
		00/11-08-079-11W4/0	461.0	463.5	McM Channel	CNRL
	MCMURRAY XX	00/07-29-079-12W4/0	443.0	447.0	McM B1 Seq	SUPERMAN
		00/07-29-079-12W4/0	447.5	448.5	McM B2 Seq	SUPERMAN
		00/11-32-079-12W4/0	464.5	465.3	McM Channel	FIRST
		00/15-32-079-12W4/0	441.0	452.0	McM Channel	SUPERMAN
		00/08-04-080-12W4/0	442.0	449.0	McM Channel	SUPERMAN
		00/06-06-080-12W4/0	439.0	445.3	McM Channel	SUPERMAN
		00/12-10-080-12W4/0	443.0	448.0	McM Channel	CNRL
		00/12-11-080-12W4/0	438.7	444.0	McM Channel	CNRL
		00/05-14-080-12W4/0	445.3	450.0	McM Channel	CNRL

Table 2. Wabiskaw McMurray Intervals Approved for Gas Production

Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
CHARD	MCMURRAY HHH	AA/09-14-078-06W4/0	336.0	342.0	McM A2 Seq	MEG
	MCMURRAY P	00/11-34-080-06W4/0	242.2	246.5	McM A2 Seq	CNRL
	MCMURRAY U/D-119	00/10-07-080-06W4/0	295.0	302.7	McM A2 Seq	CNRL
	MCMURRAY VV	00/10-11-080-07W4/0	315.2	318.0	McM A1 Seq	CNRL
		00/10-11-080-07W4/0	318.0	318.5	McM A2 Seq	CNRL
		00/07-14-080-07W4/0	320.0	323.0	McM A Channel	CNRL
		00/10-23-080-07W4/0	315.5	319.0	McM A Channel	CNRL
	WABISKAW K	00/11-28-080-06W4/0	280.2	283.0	Wbsk C Sand	CNRL
	WABISKAW U/D-034	00/06-20-080-06W4/0	282.0	284.0	Wbsk C Sand	CNRL
	WABISKAW U/D-037	00/07-13-080-07W4/0	307.0	307.6	Wbsk C Sand	CNRL
		00/07-14-080-07W4/0	317.0	319.0	Wbsk C Sand	CNRL
		00/10-23-080-07W4/0	312.5	314.0	Wbsk C Sand	CNRL
		00/09-24-080-07W4/0	283.1	284.5	Wbsk C Sand	CALPINE
		02/09-24-080-07W4/0	280.8	281.3	Wbsk C Sand	PETRO-CANADA
	WABISKAW-MCMURRAY A	00/13-27-078-06W4/0	286.0	287.0	Wbsk C Sand	SUPERMAN
		00/07-33-078-06W4/0	290.5	291.2	Wbsk C Sand	PET
		00/07-33-078-06W4/0	295.4	302.0	McM Channel	PET
		00/11-35-078-06W4/0	298.0	301.2	McM A Channel	SUPERMAN
		00/14-35-078-06W4/0	283.0	286.6	McM A Channel	SUPERMAN
		00/11-36-078-06W4/0	281.0	283.3	McM A1 Seq	NEXEN
		00/06-05-079-05W4/0	273.2	279.0	McM A2 Seq	CNRL
		00/06-06-079-05W4/0	279.2	279.9	Wbsk C Sand	CNRL
		00/06-06-079-05W4/0	280.4	285.1	McM A2 Seq	CNRL
		00/07-07-079-05W4/0	243.8	244.6	Wbsk C Sand	CNRL
		00/07-07-079-05W4/0	245.1	252.4	McM A2 Seq	CNRL
		00/03-08-079-05W4/2	374.5	785.7	McM A2 Seq	CNRL
		00/05-08-079-05W4/0	236.2	237.1	Wbsk C Sand	CNRL
		00/05-08-079-05W4/0	237.5	243.9	McM A2 Seq	CNRL
		00/05-17-079-05W4/0	212.5	214.0	Wbsk C Sand	CNRL
		00/05-17-079-05W4/0	214.0	221.8	McM A2 Seq	CNRL
		00/06-18-079-05W4/0	211.4	212.8	Wbsk C Sand	CNRL
		00/06-18-079-05W4/0	213.0	220.5	McM A2 Seq	CNRL
		00/12-19-079-05W4/0	217.0	217.7	Wbsk C Sand	CNRL
		00/12-19-079-05W4/0	218.5	224.5	McM A2 Seq	CNRL
		00/12-20-079-05W4/0	225.2	227.0	McM A1 Seq	CNRL
		00/12-20-079-05W4/0	227.0	230.0	McM A2 Seq	CNRL
		00/05-29-079-05W4/0	218.9	220.4	Wbsk C Sand	CNRL
		00/05-29-079-05W4/0	222.0	226.0	McM A2 Seq	CNRL
		00/05-30-079-05W4/0	215.0	216.0	Wbsk C Sand	CNRL
		00/05-30-079-05W4/0	217.0	220.0	Wbsk D Valley Fill	CNRL
		00/10-31-079-05W4/0	201.0	202.1	Wbsk C Sand	PET
		00/10-31-079-05W4/0	202.9	209.4	McM A2 Seq	PET
		00/13-32-079-05W4/0	214.6	215.3	Wbsk C Sand	PET
		00/13-32-079-05W4/0	216.1	222.8	McM A2 Seq	PET
		00/11-01-079-06W4/0	265.8	266.1	Wbsk C Sand	SUPERMAN
		00/11-01-079-06W4/0	266.7	269.0	Wbsk D Valley Fill	SUPERMAN
		00/11-01-079-06W4/0	269.0	271.2	McM A2 Seq	SUPERMAN
		00/14-01-079-06W4/0	257.0	257.8	Wbsk C Sand	SUPERMAN
		00/14-01-079-06W4/0	258.0	265.5	McM A2 Seq	SUPERMAN
		00/13-02-079-06W4/0	232.8	233.3	Wbsk C Sand	SUPERMAN
		00/13-02-079-06W4/0	234.0	237.0	Wbsk D Valley Fill	SUPERMAN
		00/13-02-079-06W4/0	237.0	239.3	McM A2 Seq	SUPERMAN
		00/12-03-079-06W4/0	237.3	238.2	Wbsk C Sand	SUPERMAN
		00/12-03-079-06W4/0	238.5	241.0	Wbsk D Valley Fill	SUPERMAN
		00/12-03-079-06W4/0	241.0	246.6	McM A2 Seq	SUPERMAN
		00/12-03-079-06W4/0	247.5	255.5	McM Channel	SUPERMAN
		00/08-04-079-06W4/0	249.9	250.4	Wbsk C Sand	CNRL
		00/08-04-079-06W4/0	251.4	258.5	McM A2 Seq	CNRL
		00/07-10-079-06W4/0	214.4	215.0	Wbsk C Sand	CNRL
		00/07-10-079-06W4/0	215.6	223.7	McM A2 Seq	CNRL
		00/10-11-079-06W4/0	233.5	233.9	Wbsk C Sand	CNRL
		00/12-11-079-06W4/2	216.0	217.0	Wbsk C Sand	CNRL
		00/12-11-079-06W4/2	217.0	227.0	McM A2 Seq	CNRL

Table 2. Wabiskaw McMurray Intervals Approved for Gas Production

Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
CHARD (cont.)	WABISKAW-MCMURRAY A (cont.)	00/06-12-079-06W4/0	217.5	218.0	Wbsk C Sand	CNRL
		00/06-12-079-06W4/0	218.8	223.0	Wbsk D Valley Fill	CNRL
		00/06-12-079-06W4/0	223.0	227.5	McM A2 Seq	CNRL
		00/08-13-079-06W4/0	218.0	222.8	McM A2 Seq	CNRL
		00/04-14-079-06W4/0	210.6	212.5	Wbsk C Sand	CNRL
		00/04-14-079-06W4/0	212.5	216.0	Wbsk D Valley Fill	CNRL
		00/04-14-079-06W4/0	216.0	219.8	McM A2 Seq	CNRL
		00/08-14-079-06W4/0	211.0	213.0	Wbsk C Sand	CNRL
		00/08-14-079-06W4/0	216.0	217.6	McM A2 Seq	CNRL
		00/07-15-079-06W4/0	204.6	205.5	Wbsk C Sand	CNRL
		00/07-15-079-06W4/0	206.5	208.0	Wbsk D Valley Fill	CNRL
		00/07-15-079-06W4/0	208.0	213.2	McM A2 Seq	CNRL
		00/10-16-079-06W4/0	228.8	230.0	Wbsk C Sand	CNRL
		00/10-16-079-06W4/0	230.5	234.0	Wbsk D Valley Fill	CNRL
		00/10-16-079-06W4/0	234.0	238.5	McM A2 Seq	CNRL
		00/10-21-079-06W4/0	215.3	216.2	Wbsk C Sand	CNRL
		00/10-21-079-06W4/0	217.0	218.0	Wbsk D Valley Fill	CNRL
		00/10-21-079-06W4/0	218.0	225.0	McM A2 Seq	CNRL
		00/11-22-079-06W4/0	216.1	217.1	Wbsk C Sand	PET
		00/11-22-079-06W4/0	221.9	223.0	McM A2 Seq	PET
		00/09-23-079-06W4/0	202.4	203.2	Wbsk C Sand	PET
		00/09-23-079-06W4/0	205.7	206.9	Wbsk D Valley Fill	PET
		00/06-24-079-06W4/0	207.5	208.6	Wbsk C Sand	PET
		00/06-24-079-06W4/0	210.0	216.0	McM A2 Seq	PET
		00/10-25-079-06W4/0	205.8	206.8	Wbsk C Sand	PET
		00/10-25-079-06W4/0	207.5	214.2	McM A2 Seq	PET
		00/09-26-079-06W4/0	189.9	190.7	Wbsk C Sand	PET
		00/09-26-079-06W4/0	191.8	194.5	Wbsk D Valley Fill	PET
		00/09-26-079-06W4/0	194.5	198.5	McM A2 Seq	PET
		00/11-27-079-06W4/0	230.0	231.0	Wbsk C Sand	PARAMOUNT
		00/11-28-079-06W4/0	248.4	249.7	Wbsk C Sand	CNRL
		00/11-28-079-06W4/0	250.6	252.5	Wbsk D Valley Fill	CNRL
		00/11-28-079-06W4/0	252.5	257.8	McM A2 Seq	CNRL
		AA/10-30-079-06W4/0	259.0	260.0	Wbsk C Sand	PETRO-CANADA
		AA/10-30-079-06W4/0	261.0	267.0	McM A2 Seq	PETRO-CANADA
		00/07-32-079-06W4/0	286.0	289.0	Wbsk D Valley Fill	CNRL
		00/07-32-079-06W4/0	289.0	293.0	McM A2 Seq	CNRL
		00/06-34-079-06W4/0	237.1	237.9	Wbsk C Sand	PET
		02/06-34-079-06W4/0	236.0	237.0	Wbsk C Sand	PET
		00/13-34-079-06W4/0	243.0	243.5	Wbsk C Sand	PET
		00/13-34-079-06W4/0	245.0	247.2	Wbsk D Valley Fill	PET
		00/13-35-079-06W4/0	234.5	235.2	Wbsk C Sand	PET
		00/13-35-079-06W4/0	236.0	243.0	McM A2 Seq	PET
		00/08-36-079-06W4/0	188.2	189.0	Wbsk C Sand	PET
		00/08-36-079-06W4/0	189.8	193.0	Wbsk D Valley Fill	PET
		00/08-36-079-06W4/0	193.0	197.0	McM A2 Seq	PET
		00/05-05-080-05W4/0	211.7	213.0	Wbsk C Sand	PET
		00/05-05-080-05W4/0	213.5	219.7	McM A2 Seq	PET
		00/02-06-080-05W4/0	187.5	188.5	Wbsk C Sand	PET
		00/02-06-080-05W4/0	189.5	196.0	McM A2 Seq	PET
		00/06-07-080-05W4/0	191.3	192.8	Wbsk C Sand	PET
		00/06-07-080-05W4/0	194.5	200.0	McM A2 Seq	PET
		00/03-08-080-05W4/0	188.7	190.0	Wbsk C Sand	PET
		00/07-01-080-06W4/0	202.8	203.9	Wbsk C Sand	PET
		00/07-01-080-06W4/0	205.0	211.1	McM A2 Seq	PET
		00/03-02-080-06W4/0	234.5	236.0	Wbsk C Sand	CNRL
		00/03-02-080-06W4/0	237.0	243.3	McM A2 Seq	CNRL
		00/10-02-080-06W4/0	231.5	232.0	Wbsk C Sand	CNRL
		00/03-03-080-06W4/0	246.3	248.0	Wbsk C Sand	CNRL
		00/03-03-080-06W4/0	249.0	251.0	Wbsk D Valley Fill	CNRL
		00/03-03-080-06W4/0	251.0	254.2	McM A2 Seq	CNRL
		00/07-04-080-06W4/0	290.8	292.0	Wbsk C Sand	CNRL
		00/07-04-080-06W4/0	293.0	295.0	Wbsk D Valley Fill	CNRL

Table 2. Wabiskaw McMurray Intervals Approved for Gas Production

Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
CHARD (cont.)	WABISKAW-MCMURRAY A (cont.)	00/07-04-080-06W4/0	295.0	299.0	McM A2 Seq	CNRL
		00/07-06-080-06W4/0	291.0	294.0	McM A1 Seq	CNRL
		00/11-09-080-06W4/0	303.0	304.5	Wbsk C Sand	CNRL
		00/11-09-080-06W4/0	305.0	307.0	Wbsk D Valley Fill	CNRL
		00/11-09-080-06W4/0	307.0	311.0	McM A2 Seq	CNRL
		00/09-11-080-06W4/0	221.8	223.5	Wbsk C Sand	CNRL
		00/09-11-080-06W4/0	226.0	229.6	McM A2 Seq	CNRL
		00/15-11-080-06W4/0	225.0	226.0	Wbsk C Sand	CNRL
		00/15-11-080-06W4/0	230.0	233.5	McM A2 Seq	CNRL
		00/05-12-080-06W4/0	208.6	210.2	Wbsk C Sand	PET
		00/05-12-080-06W4/0	215.0	217.0	McM A2 Seq	PET
		00/04-13-080-06W4/0	215.6	222.0	McM A2 Seq	PET
		00/07-14-080-06W4/0	237.3	239.0	Wbsk C Sand	CNRL
		00/07-14-080-06W4/0	240.0	245.5	McM A2 Seq	CNRL
		00/06-22-080-06W4/0	309.3	313.6	McM A2 Seq	CNRL
		00/07-23-080-06W4/0	250.0	256.0	McM A2 Seq	CNRL
CLYDEN	MCMURRAY AA	00/07-19-076-12W4/0	511.5	513.4	McM A2 Seq	CNRL
		00/11-30-076-12W4/0	490.0	492.0	McM A2 Seq	CNRL
		00/03-25-076-13W4/0	492.0	494.7	McM A2 Seq	CNRL
CORNER	MCMURRAY A	00/12-16-081-09W4/0	419.8	420.8	McM A1 Seq	PET
	MCMURRAY A	02/12-16-081-09W4/0	419.2	420.7	McM A1 Seq	PET
DIVIDE	MCMURRAY A	00/16-08-082-12W4/0	447.2	449.0	McM B1 Seq	HUSKY
	MCMURRAY A	00/05-16-082-12W4/0	447.1	448.9	McM B1 Seq	PET
		00/10-17-082-12W4/0	432.4	433.3	McM B1 Seq	PET
		00/05-21-082-12W4/0	415.6	416.6	McM B1 Seq	STYLUS
		02/05-21-082-12W4/0	422.2	423.0	McM B1 Seq	STYLUS
	MCMURRAY R	00/07-28-082-12W4/0	412.0	415.0	McM B2 Seq	STYLUS
	MCMURRAY V	00/02-19-082-12W4/0	396.0	397.3	McM B1 Seq	CNRL
	MCMURRAY W	00/06-27-082-12W4/0	446.2	448.0	McM B1 Seq	STYLUS
		00/07-28-082-12W4/0	405.0	408.0	McM B1 Seq	STYLUS
GLOVER	MCMURRAY B	00/09-05-076-10W4/0	447.0	448.0	McM A1 Seq	PET
		00/06-07-076-10W4/0	436.5	438.0	McM A1 Seq	PET
HANGINGSTONE	MCMURRAY B2B	00/14-01-081-08W4/0	399.0	402.0	McM A1 Seq	NORTHSTAR
	MCMURRAY BB	00/08-30-082-09W4/0	438.0	439.0	McM A1 Seq	NORTHSTAR
		00/08-30-082-09W4/0	439.0	441.0	McM A2 Seq	NORTHSTAR
	MCMURRAY K3K	00/08-07-081-07W4/0	381.0	382.8	McM A2 Seq	Calpine
		00/06-17-081-07W4/0	378.5	381.5	McM A2 Seq	Calpine
		00/11-13-081-08W4/0	439.8	441.5	McM A2 Seq	NORTHSTAR
		00/10-14-081-08W4/0	453.2	456.2	McM A2 Seq	NORTHSTAR
	MCMURRAY LL	00/07-05-083-08W4/0	435.0	436.0	McM A1 Seq	NORTHSTAR
	MCMURRAY RR	00/09-32-081-11W4/0	464.0	469.6	McM B1 Seq	STYLUS
		00/08-34-081-11W4/0	444.0	445.0	McM B1 Seq	STYLUS
		00/12-34-081-11W4/0	452.0	453.0	McM B1 Seq	STYLUS
		00/06-04-082-11W4/0	453.3	454.3	McM B1 Seq	STYLUS
	MCMURRAY S2S	00/03-34-080-07W4/0	334.7	338.5	McM A2 Seq	Calpine
		00/04-35-080-07W4/0	318.7	322.5	McM A Channel	Calpine
		00/14-03-081-07W4/0	347.5	350.5	McM A2 Seq	Calpine
	MCMURRAY U/D-137	AA/10-22-084-08W4/0	425.5	428.0	McM A1 Seq	PETRO-CANADA
	MCMURRAY UNDEFINED 1	00/09-27-081-11W4/0	434.5	441.0	McM A Channel	STYLUS
	MCMURRAY UNDEFINED 4	AA/03-33-082-08W4/0	456.2	457.0	McM A2 Seq	PETRO-CANADA
	MCMURRAY UUU	00/12-01-084-08W4/0	443.4	444.5	McM A1 Seq	NORTHSTAR
		00/11-08-084-08W4/0	437.6	440.0	McM A1 Seq	NORTHSTAR
		AA/12-08-084-08W4/0	434.6	438.0	McM A1 Seq	PETRO-CANADA
		00/07-09-084-08W4/0	437.2	440.0	McM A1 Seq	NORTHSTAR
		00/02-10-084-08W4/0	442.0	443.0	McM A1 Seq	NORTHSTAR
		00/05-11-084-08W4/0	444.0	445.0	McM A1 Seq	NORTHSTAR
		AA/05-17-084-08W4/0	428.0	429.0	McM A1 Seq	PETRO-CANADA
	MCMURRAY V2V	00/03-34-080-07W4/0	340.4	347.0	McM B1 Channel	Calpine
		00/04-35-080-07W4/0	325.0	330.0	McM B1 Seq	Calpine
		00/04-35-080-07W4/2	331.2	333.1	McM B2 Seq	Calpine
		00/14-03-081-07W4/0	352.8	358.0	McM B1 Channel	Calpine
	WABISKAW-MCMURRAY D	00/16-31-080-07W4/0	363.0	365.4	McM A2 Seq	Northstar
		00/14-25-080-08W4/0	386.4	388.5	McM A2 Seq	Northstar

Table 2. Wabiskaw McMurray Intervals Approved for Gas Production

Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
HANGINGSTONE	WABISKAW-MCMURRAY D (cont.)	00/12-26-080-08W4/0	395.5	397.8	McM A2 Seq	Northstar
HARDY	WABISKAW A	00/03-15-077-04W4/0	331.2	335.0	Wbsk C Sand	PET
	WABISKAW D	00/04-18-076-03W4/0	369.8	372.5	Wbsk C Sand	TALISMAN
		00/08-13-076-04W4/0	357.5	361.0	Wbsk C Sand	TALISMAN
	WABISKAW F	00/03-11-076-04W4/0	366.5	368.5	Wbsk C Sand	TALISMAN
KIRBY	UPPER MANNVILLE J4J	00/11-29-074-07W4/0	428.0	429.0	Wbsk B Valley Fill	ISH
		00/12-32-074-07W4/0	424.0	426.0	Wbsk B Valley Fill	BP
		00/11-33-074-07W4/0	408.0	411.0	Wbsk B Valley Fill	BP
		00/10-34-074-07W4/0	405.5	406.5	Wbsk B Valley Fill	BP
		00/09-04-075-07W4/0	409.7	413.7	Wbsk B Valley Fill	BP
	UPPER MANNVILLE O3O	00/06-32-073-09W4/0	426.8	427.8	Wbsk B Valley Fill	CNRL
		00/16-33-073-09W4/0	424.3	426.5	Wbsk B Valley Fill	CNRL
		00/15-04-074-09W4/0	424.5	428.0	Wbsk B Valley Fill	CNRL
		00/16-05-074-09W4/0	429.5	431.0	Wbsk B Valley Fill	CNRL
		00/12-07-074-09W4/0	446.0	447.0	Wbsk B Valley Fill	CNRL
		00/11-08-074-09W4/0	435.3	437.6	Wbsk B Valley Fill	CNRL
		00/12-09-074-09W4/0	424.5	428.5	Wbsk B Valley Fill	CNRL
		00/06-17-074-09W4/0	431.3	435.0	Wbsk B Valley Fill	CNRL
		00/06-18-074-09W4/0	440.5	442.0	Wbsk B Valley Fill	CNRL
		00/07-20-074-09W4/0	420.5	425.0	Wbsk B Valley Fill	CNRL
		00/16-12-074-10W4/0	450.0	451.0	Wbsk B Valley Fill	CNRL
		00/02-13-074-10W4/0	446.0	447.5	Wbsk B Valley Fill	CNRL
		00/02-24-074-10W4/0	453.0	456.0	Wbsk B Valley Fill	CNRL
LEISMER	WABISKAW UNDEFINED 1	AB/02-04-076-06W4/0	357.5	358.0	Wbsk C Sand	DEVON
	WABISKAW UNDEFINED 2	AA/03-04-076-06W4/0	355.0	356.0	Wbsk C Sand	DEVON
	WABISKAW UNDEFINED 3	AA/14-09-076-06W4/0	331.0	331.5	Wbsk C Sand	ENCANA
	WABISKAW MCMURRAY A	00/11-08-079-06W4/0	244.0	251.5	McM A2 Seq	CNRL
	WABISKAW MCMURRAY E	00/10-26-079-09W4/0	409.0	411.0	Wbsk C Sand	ENCANA
		00/10-35-079-09W4/0	404.9	406.0	Wbsk C Sand	ENCANA C
		00/04-04-076-06W4/0	349.0	351.0	Wbsk C Sand	DEVON ARL
		00/04-04-076-06W4/0	351.0	358.0	McM A2 Seq	DEVON ARL
	WABISKAW MCMURRAY G	AA/12-04-076-06W4/0	353.2	354.2	Wbsk C Sand	DEVON
		AA/12-04-076-06W4/0	354.2	357.0	McM A2 Seq	DEVON
		AA/13-04-076-06W4/0	353.0	354.0	McM A2 Seq	DEVON ARL
		00/03-05-076-06W4/0	352.0	355.0	Wbsk C Sand	DEVON ARL
		AA/08-05-076-06W4/0	348.0	349.4	Wbsk C Sand	DEVON ARL
		00/16-05-076-06W4/0	347.0	349.0	Wbsk C Sand	DEVON ARL
		AA/07-09-076-06W4/0	339.5	340.2	McM A2 Seq	ENCANA C
		AA/13-09-076-06W4/0	328.0	329.9	McM A2 Seq	ENCANA C
		AA/14-09-076-06W4/0	333.0	333.5	McM A2 Seq	ENCANA
NEWBY	MCMURRAY X	00/08-09-083-05W4/0	226.8	232.0	Wbsk D Valley Fill	PET
	WABISKAW AA	00/14-20-083-05W4/0	233.3	234.0	Wbsk C Sand	CNRL
		00/06-30-083-05W4/0	258.0	259.0	Wbsk C Sand	CNRL
	WABISKAW U/D-066	00/13-27-084-06W4/0	220.5	221.5	Wbsk C Sand	CNRL
	WABISKAW-MCMURRAY G	00/13-26-084-06W4/0	209.0	210.0	Wbsk D Valley Fill	CNRL
		00/13-26-084-06W4/0	210.7	211.3	McM A1 Seq	CNRL
		00/13-26-084-06W4/0	214.0	227.0	McM Channel	CNRL
		00/13-27-084-06W4/0	223.2	225.0	McM A1 Seq	CNRL
		00/13-27-084-06W4/0	225.5	226.2	McM Channel	CNRL
		00/10-34-084-06W4/0	216.2	218.7	McM A1 Seq	CNRL
		00/10-34-084-06W4/0	220.0	231.3	McM Channel	CNRL
		00/10-35-084-06W4/0	195.6	198.2	McM A1 Seq	CNRL
		00/10-35-084-06W4/0	200.0	214.4	McM Channel	CNRL
		00/07-01-085-06W4/0	191.4	195.0	McM A1 Seq	CNRL
		00/10-02-085-06W4/0	188.0	191.0	McM A1 Seq	CNRL
		00/10-02-085-06W4/0	193.0	204.3	McM Channel	CNRL
		00/09-04-085-06W4/0	202.5	204.3	McM A1 Seq	CNRL
		00/06-10-085-06W4/0	157.0	160.0	McM A1 Seq	CNRL
		00/06-10-085-06W4/0	161.0	174.3	McM Channel	CNRL
		00/07-14-085-06W4/0	147.0	148.0	McM A1 Seq	CNRL
		00/07-14-085-06W4/0	149.0	160.3	McM Channel	CNRL
	WABISKAW-MCMURRAY H	00/12-07-083-04W4/0	201.0	204.5	Wbsk D Valley Fill	CNRL
		00/15-18-083-04W4/0	193.0	195.5	Wbsk D Valley Fill	CNRL

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Field Name	Pool Name	Well ID	Pay Top Depth	Pay Base Depth	Stratigraphic Interval	Licensee
Newby (cont.)	WABISKAW-MCMURRAY H (cont.)	00/15-18-083-04W4/0	197.5	209.8	McM Channel	CNRL
		00/02-19-083-04W4/0	188.0	190.5	Wbsk D Valley Fill	CNRL
		00/02-19-083-04W4/0	191.5	207.8	McM Channel	CNRL
		00/13-19-083-04W4/0	192.3	194.9	Wbsk C Sand	CNRL
		00/13-19-083-04W4/0	195.0	197.5	Wbsk D Valley Fill	CNRL
		00/11-11-083-05W4/0	196.3	197.3	Wbsk C Sand	PET
		00/11-11-083-05W4/0	197.5	201.3	Wbsk D Valley Fill	PET
		00/12-12-083-05W4/0	196.0	197.2	Wbsk C Sand	PET
		00/12-12-083-05W4/0	197.2	201.0	Wbsk D Valley Fill	PET
		00/12-12-083-05W4/0	206.5	208.0	McM Channel	PET
		00/15-13-083-05W4/0	184.0	187.0	Wbsk C Sand	CNRL
		00/15-13-083-05W4/0	187.0	190.0	Wbsk D Valley Fill	CNRL
		00/15-13-083-05W4/0	190.2	208.0	McM Channel	CNRL
		00/15-14-083-05W4/0	203.7	206.4	Wbsk D Valley Fill	CNRL
		00/15-14-083-05W4/0	208.7	220.0	McM Channel	CNRL
		02/15-14-083-05W4/0	204.0	206.0	Wbsk D Valley Fill	CNRL
		00/15-15-083-05W4/0	246.0	248.2	Wbsk D Valley Fill	CNRL
		00/14-20-083-05W4/0	234.5	238.0	Wbsk D Valley Fill	CNRL
		00/08-21-083-05W4/0	232.0	235.0	Wbsk D Valley Fill	CNRL
		00/07-22-083-05W4/0	220.0	223.0	Wbsk D Valley Fill	CONOCO
		00/14-22-083-05W4/0	212.0	215.0	Wbsk D Valley Fill	CNRL
		00/05-24-083-05W4/0	206.0	208.1	Wbsk D Valley Fill	CNRL
		00/05-24-083-05W4/0	214.0	215.8	McM Channel	CNRL
		00/12-25-083-05W4/0	199.6	202.0	Wbsk D Valley Fill	CNRL
		00/05-28-083-05W4/0	208.0	211.0	Wbsk D Valley Fill	CNRL
		00/05-28-083-05W4/0	212.0	226.0	McM Channel	CNRL
		00/11-32-083-05W4/0	210.0	212.7	Wbsk D Valley Fill	CNRL
		00/11-32-083-05W4/0	214.0	225.0	McM Channel	CNRL
		00/13-33-083-05W4/0	205.0	207.0	Wbsk D Valley Fill	CNRL
		00/13-33-083-05W4/0	208.5	223.0	McM Channel	CNRL
		00/09-35-083-05W4/0	187.5	189.5	Wbsk D Valley Fill	CNRL
		00/09-35-083-05W4/0	190.5	207.0	McM Channel	CNRL
		00/12-05-084-05W4/0	225.5	227.0	McM Channel	CNRL
TAR	MCMURRAY U/D-005	00/02-02-100-14W4/0	523.5	524.0	Wbsk D Sand	ENCANA
	MCMURRAY U/D-037	00/02-02-100-14W4/0	537.0	539.0	McM Channel	ENCANA
	WABISKAW P	00/06-13-099-14W4/0	525.0	526.0	Wbsk C Sand	ENCANA
		00/03-14-099-14W4/0	513.5	517.8	Wbsk C Sand	ENCANA
		00/04-22-099-14W4/0	521.0	526.5	Wbsk C Sand	ENCANA
	WABISKAW Q	00/12-28-099-14W4/0	509.8	511.2	Wbsk C Sand	ENCANA
	WABISKAW U/D-021	00/15-16-100-13W4/0	473.5	475.0	Wbsk D Sand	ENCANA
	WABISKAW U/D-035	AA/11-24-099-14W4/0	531.6	534.0	Wbsk C Sand	IMPERIAL
		00/12-24-099-14W4/0	531.0	534.2	Wbsk C Sand	ENCANA
	WABISKAW U/D-037	00/02-30-099-14W4/0	498.0	499.0	Wbsk C Sand	ENCANA
	WABISKAW U/D-038	00/05-35-099-14W4/0	533.0	534.7	Wbsk C Sand	ENCANA
		00/02-02-100-14W4/0	517.0	522.5	Wbsk C Sand	ENCANA
	WABISKAW U/D-039	AA/12-12-099-15W4/0	449.5	451.5	Wbsk C Sand	IMPERIAL
		00/09-14-099-15W4/0	470.0	471.0	Wbsk C Sand	ENCANA
THORNBURY	MCMURRAY E5E	00/02-31-079-10W4/0	414.0	415.0	McM A1 Seq	CNRL
		00/02-31-079-10W4/0	416.0	417.0	McM A2 Seq	CNRL
	MCMURRAY G2G	00/04-19-079-10W4/0	431.0	433.0	McM A2 Seq	CNRL
		00/01-25-079-11W4/0	424.0	425.0	McM A2 Seq	CNRL
	MCMURRAY S5S	00/07-29-079-12W4/0	458.2	465.5	McM C Channel	SUPERMAN
UNDEFINED	WABISKAW UNDEFINED	AA/05-28-082-08W4/0	448.5	449.0	Wbsk C Sand	PETRO-CANADA

APPENDIX 1 THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in report)	Witnesses
BP Canada Energy Company A. L. McLarty, Q.C. R. L. Mooney	
Canadian Natural Resources Limited P. J. McGovern	J. A. Faucher, P.Eng. Q. Jiang, Ph.D., P.Eng. J. J. Waterfield, P.Geol.
Devon Canada Corporation S. M. Munro	
EnCana Corporation A. Reid D. Castellino D. G. Davies	
EUB Staff Submission Group (SSG) J.P. Mousseau	M. E. Connelly, P.Geol. B. Fairgrieve, P.Geol. F. J. Hein, Ph.D., P.Geol. T. R. Keelan, P.Eng. K. F. Schuldhaus, P.Eng. W. A. Warren, P.Eng.
ISH Energy Ltd. A. L. McLarty, Q.C. R. L. Mooney	J. E. Mathison, P.Geol., of Fekete J. K. Wilhelm, P.Eng., of Fekete
Nexen Canada Ltd. R. Block K. Johnston	L. Skulski, P.Geol., P.Eng.

(continued)

APPENDIX 1 THOSE WHO APPEARED AT THE HEARING (concluded)

Principals and Representatives (Abbreviations used in report)	Witnesses
Paramount Energy Operating Corp. L. M. Sali, Q.C. T. Mah S. M. Munro	S. M. F. Ali, Ph.D., Consultant E. R. Crain, P.Eng., Consultant S. Chugh. P.Eng., of Epic Consulting Services J. R. Engelman, P.Eng. H. Nguyen, of ECL Canada B. Norris, P.Geol. M. J. Ranger, Ph.D., P.Geol., Consultant
Paramount Resources Limited G. Bunio M. Alexander	
Petro-Canada W. T. Corbett, Q.C. S. R. Miller R. Kolber	M. Cimolai, Consultant J. Fong G. Stabb, P.Geol., of Durando Resources K. N. Wilde
Stylus Exploration Inc. D. W. Rowbotham	P. D. Evans, P.Geol.
EUB staff G. D. Perkins K. Bieber, P.Geol. G. W. Dilay, P.Eng. C. Evans, P.Geol. R. Happy, P.Geol. E. E. Smith, P.Eng.	

EUB Alberta Energy and Utilities Board

Decision 2005-122

Phase 3 Final Proceeding
Closing and Reply Arguments

December 21,2005

PROCEEDING NO. 1347905

ALBERTA ENERGY AND UTILITIES BOARD
PROCEEDING NO. 1347905: PHASE 3 PROCEEDINGS UNDER BITUMEN CONSERVATION REQUIREMENTS ATHABASCA WABISKAW-McMURRAY AREA

PROCEEDINGS

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J. Dilay, Esq.	Chair
C. Langlo, Ms.	Member
G. Williams, Dr.	Member
G. Perkins, Esq.	Board Counsel
G. Dilay, Esq.	Board Staff
K. Bieber, Ms.	Board Staff
E. Smith, Esq.	Board Staff
R. Happy, Esq.	Board Staff
C. Evans, Esq.	Board Staff
W. Corbett, QC	Petro-Canada
S. R. Miller, Esq.	
R. Kolber, Ms.	
R. Block, Esq.	Nexen Inc.
K. Johnston, Ms.	
P. McGovern, Esq.	Canadian Natural Resources Limited
A. McLarty, Esq.	ISH Energy Ltd. and BP Canada Energy Company
R. L. Mooney, Esq.	
L. Sali, QC	Paramount Energy Trust and Corporation
S. Munro, Esq.	
T. Mah, Ms.	
D. Rowbotham, Esq.	Stylus Energy Inc.
S. Munro, Esq.	Devon Canada Corporation

A. Reid, Esq. EnCana Corporation
D. Castellino, Esq.
D. Davies, Esq.
M. Alexander, Ms. Paramount Resources
G. Bunio, Esq.

E. Kuemmel, CSR(A), RPR Court Reporters
B. Ball, Ms. CSR(A), RPR, CRR

THE CHAIR: Thank you. Please be seated.

Are there any housekeeping matters before we begin argument? I don't see anyone coming forward. Mr. Mousseau.

09:05

MR. MOUSSEAU: Thank you, Mr. Chairman. I have provided a copy of my argument to the court reporter and I do have three extra copies if the panel would wish copies to follow along. There are references to transcripts throughout my copy but I won't be referring to them in my argument, sir.

THE CHAIR: Sure, we'll have the copies, sir.

MR. MOUSSEAU: GB 2003-28 states:

> "The Board's task is to ensure that
>
> 09:06
>
> energy resources are conserved and not wasted, having regard for both the near and long term interests of all Albertans. Weighing the benefits of near and long term economic value in

> the public interest is complex. The difficulty of this task increases when there are competing interests from developers. Couple these circumstances with emerging technology and limited data and the resource conservation decision is further complicated.
>
> In this case, the Board's challenge is one of managing risk in a fair and responsible way until such time as
>
> 09:07
>
> uncertainties can be reduced or eliminated." [GB 2003-28, Bitumen Conservation Requirements Athabasca Wabiskaw-McMurray, page 1-2].

Since 1997 the EUB has expended considerable effort to address the issue of bitumen conservation. These efforts include several protracted proceedings, the general inquiry, Surmont and Chard Leismer as well as numerous joint EUB industry initiatives. The SSG observes that the underlying conclusion in each of these proceedings was that

09:07

the production of associated gas presented a significant risk to future bitumen recovery.

While significant complex evidence has been filed in each stage of the Phase 3 proceeding, the SSG considers that the Board's fundamental task is once again to assess the risk posed by the production of gas that is in association with potentially recoverable bitumen.

The SSG recognizes that the stakes in this proceeding are considerable, not just for those who have leased the gas and bitumen recourses in question but for all Albertans. The bitumen resource that lies at the heart of this issue is significant. In its January 26, 2004 submission, the SSG calculated the bitumen resource at risk in the RGS area to be approximately 8.1 billion m3 or 51 billion barrels. Of that resource, the SSG estimated that approximately 4.05 billion m3 or 25.5 billion barrels were recoverable and that the energy value of this bitumen was 540 times that of the remaining producible gas in the area.

The Board has recognized that it is managing risk. There is a maxim or principle in environmental law known as the precautionary principle. It basically states that if a proposed activity carries with it the possibility of environmental harm, but that harm is not completely proven, then that activity may not be allowed. The SSG contends that the EUB's historical approach to the gas bitumen issue has been consistent with the precautionary principle, albeit as applied from a resource conservation perspective.

A theme throughout the SSG's evidence and this argument is that managing risk requires that the Board err on the side of caution where it has inconclusive evidence regarding conservation risk.

It continues to be the SSG's opinion that the production of gas associated with potentially recoverable bitumen represents a significant and unacceptable risk to ultimate bitumen recovery. The SSG believes that the evidence before the Board clearly demonstrates that the production of associated gas carries with it the possibility of irreversible sterilization of Alberta's most significant energy resource.

As the impact of gas production on the ultimate recovery of potentially recoverable bitumen remains uncertain, it is the SSG's view that associated gas must be shut-in. In this argument, the SSG will provide its rationale, as derived from the evidence filed in this proceeding, for its continued support of this position.

The structure of the SSG's argument will follow closely the issues outline provided by the Board in its August 8, 2005 letter.

First, I will comment briefly on the scope and nature of the final proceeding and the Board's authority to make final production determinations within the RGS area.

Second, I will address the issues of gas pooling and regions of influence.

Third, I will provide the SSG's views with respect to what constitutes potentially recoverable bitumen.

Fourth, I will discuss issues relating to the lateral continuity of mudstones and shales with a focus on the Wabiskaw D shale and Wabiskaw C mudstone.

Fifth, I will address the effect of associated gas production on SAGD bitumen recovery with a focus on Paramount's modeling results.

Finally, I will comment briefly on pressure monitoring requirements and future ID 99-1 applications.

Following the Chard Leismer decision and additional consultation with stakeholders, the EUB issued GB 2003-28. The SSG considers this GB to be the genesis of this proceeding, as it announced the EUB's bitumen conservation requirements for gas production from the Wabiskaw McMurray area in the Athabasca oil sands area. The GB outlined the regulatory process the Board would follow for determining the ultimate production status of gas wells and intervals in the Wabiskaw McMurray.

The GB referred to the Board's comprehensive review of the gas bitumen issue since 1997 and summarized the EUB's conclusions in that regard as follows:

First, associated gas production presents an unacceptable risk to bitumen recovery using steam assisted gravity drainage (SAGD).

Currently, there are no proven technologies that satisfactorily mitigate this risk.

Within a defined area, Wabiskaw McMurray gas production that is associated with potentially recoverable bitumen must be identified and shut in as soon as possible.

And fourth, the best available method to identify non-associated gas production is through a regional geological study. [EUB GB 2003-28, page 2].

The SSG considers that these conclusions necessarily constitute the starting point for this, the Phase 3 proceeding. The SSG argues that the onus of demonstrating that these propositions are invalid lies with those who have taken an alternate view in this proceeding.

In Decision 2004-088, the pre-hearing decision for this proceeding, the Board determined that all non-confidential wells and intervals in the RGS area, or in pools that overlap the RGS area, including the wells considered in the Chard Leismer decision, would be eligible for consideration by interested parties in the final proceeding.

Further, the Board made two important rulings regarding the scope of the final proceeding and the nature of evidence that could be filed therein.

First, the Board stated that it would impose no restrictions, beyond the observance of the Board's normal evidentiary requirements on the evidence that parties may present at the hearing. The SSG understood this ruling essentially allowed hearing participants to challenge any aspect of Decision 2004-045, as well as any of the four conclusions listed in GB 2003-28.

Second, the Board confirmed that its final determinations regarding gas production status in the RGS area would be based on all evidence filed by parties in the two interim proceedings and during the final proceeding. As such, the SSG asserts that the Board should confirm all decisions or determinations made in the interim proceeding that have not been contested in the final proceeding. The SSG asserts that this approach should not be applied only to uncontested wells or intervals as noted by the Board, but also to general principles established in the interim proceeding for the assessment of bitumen conservation.

With respect to the Board's authority to make final production status recommendations for wells and intervals in the RGS area, the SSG asserts that the Board has both the general and specific legislative authority to take all appropriate steps to conserve Alberta's energy resources including oil sands resources. The SSG considers that the Board appropriately described its authority to make such decisions on pages 2 and 3 of Decision 2004-045 and the SSG does not intend to comment further in this regard.

Moving on to gas pooling and regions of

influence. In this section, the SSG will first address those wells and intervals where it disagrees with the production status advocated by Stylus, CNRL or ISH on the basis of pooling.

Second, the SSG will critique, in some detail, the pooling exercise for the Hardy Wabiskaw McMurray A Pool conducted by EPIC Consultants on behalf of Paramount.

Since the interim hearing, the SSG has utilized the gas pooling principles of the RGS and identified additional wells whose gas production has the potential to impact potentially recoverable bitumen. These include wells not previously identified in the RGS and some wells which the Board allowed to produce pursuant to Decision 2004-045.

It is the SSG's view that any production from these wells will impact potentially recoverable bitumen. Other participants have presented alternate pooling interpretations that isolate the gas accumulations from potentially recoverable bitumen.

The SSG considers that its pre-hearing submissions on this matter adequately explain the SSG's position in this regard and does not intend to repeat them here.

Both pooling interpretations are on the record and it is up to the Board to determine the most representative pooling interpretation. The SSG argues that if the Board concludes there is uncertainty in pooling interpretation of the wells, it should deny production from these wells, since any production from these wells may pose a significant risk to potentially recoverable bitumen.

Moving on now to the EPIC study.

The stated objective of that study was to determine vertical and lateral isolation of gas pools within the currently defined Hardy Wabiskaw McMurray A Pool using pressure data and integrated engineering techniques.

As the SSG understands it, EPIC's study was based largely on pressure trend comparisons, and lateral isolation was interpreted wherever trends were different. The foundation of these trend comparisons appears to the SSG to be that every gas pool in Hardy has high permeability and continuity, and wells within the same pool should have similar pressure trends.

The SSG contends that the study performed by EPIC is flawed and that its conclusions cannot be relied upon by the Board for determining whether gas in the Hardy Wabiskaw McMurray A Pool is in association with potentially recoverable bitumen.

The SSG asserts that the EPIC study suffers from the following shortcomings:

First, the study focused almost exclusively on the issue of lateral isolation between gas pools while virtually ignoring the more important issue of vertical isolation between gas pools and bitumen bearing zones.

Next, there are limitations associated with the pressure data available for the Hardy Wabiskaw McMurray A Pool, due to both the quality and quantity of the data.

Next, the pressure data relied upon by EPIC to support its interpretation of a number of discrete high permeability pools is equally supportive of a single pool comprised of several geological sequences with limited lateral communication between good permeability sands.

Next, the integrated engineering techniques used to confirm EPIC's pressure conclusions are not consistently applied and where there is a disagreement between pressure data and other analysis, the pressure data is relied upon.

And finally, it's the SSG's contention that EPIC's pooling exercise is largely irrelevant unless the Board abandons its definition of potentially recoverable bitumen and its adoption of the "accommodation space" principle. Each of these issues will be addressed in some detail.

Under cross-examination EPIC agreed that the available pressure data was not gathered for the purpose of determining vertical isolation between gas pools and underlying bitumen resources and stated that there was very limited available data to assist in such an endeavour.

EPIC conceded that the primary focus of the study was to determine lateral isolation of gas pools.

The SSG is of the view that a determination of lateral isolation in Hardy may not be relevant if each of the pools identified remains in association with potentially recoverable bitumen.

On page 6 of Decision 2004-045 the Board stated the following:

> "The Board acknowledges that there are significant limitations to the use of pressure data in determining gas pooling in the areas under consideration. These limitations are due to both the quantity and quality of the pressure data, including the lack of historical pressure data, commingling of production and pressure measurements from different stratigraphic intervals, insufficient shut-in times and, in some cases, the use of surface pressures.
>
> The Board found very few cases where the pressure data were sufficiently

> definitive to base pooling decisions upon."

The SSG asserts that the pressure data utilized in the EPIC study suffers from all of the shortcomings identified above.

The SSG disputes EPIC's assertion that there were over 300 usable pressure points in Hardy. The SSG contends that approximately 30 per cent of those pressure points are actually redundant or unstabilized pressure measurements that were part of the initial flow and buildup test procedure conducted on many wells in Hardy.

In the SSG's opinion, the quantity of the useful pressure data is significantly less than indicated by EPIC.

The quality of the available pressure data, as well as the conclusions drawn therefrom, is equally suspect from the SSG's perspective.

First, while EPIC asserted that a quality check of the data had been performed, it confirmed that actual test data was not reviewed.

The SSG's cross-examination of EPIC exposed numerous data errors that were incorporated into the EPIC study. [Transcript, p.1201,1202, 1203, 1284, 1285, 1286, 128.]

The SSG contends that such undetected errors had an impact on EPIC's interpretation of drainage and decline trends.

Second, the SSG notes that 10 per cent of the pressures used by EPIC were surface pressures taken in early 2005, which may have introduced significant error due to water influx.

Given the significant stabilization times associated with these surface pressures, differences in measured pressures of 100 or 200 kPa may invalidate EPIC's interpretation of good continuity within gas pools in Hardy.

Third, a qualitative review was provided by Fekete Associates of 75 pressure tests in Hardy. The SSG observes that only 39 of these were pressure build-up tests. All but 5 of these pressure build-up tests were of short duration, had a limited radius of investigation, and built up rapidly.

Since the dimensionless build-up plot in Appendix B is comprised of initial flow tests, mostly of short-duration[Epic Hardy Study, February 2005, Appendix B, Fig.9, p.B-9].

The SSG submits that it is not representative of the pressure stabilization time for wells on continuous production for months or years. In addition, because of their limited radius of investigation, the SSG contends that the short flow tests, which form the majority of test information available, provide no useful information on the permeability and continuity between well locations.

Of the 75 tests reviewed by Fekete, the SSG understands from EPIC's testimony that 36 were static gradients. The SSG submits that there is no basis for assuming that these tests measure stabilized reservoir pressures [Transcript, p.1228]

The SSG contends that this point was demonstrated in its cross-examination of EPIC regarding the 8-20-77-5W4 well which had a significantly higher measured pressure in 1988 than would be expected from the decline trend established by its 1987 measured pressure.

The only obvious cause was that the 1988 test had a significantly longer shut-in time. The SSG argues that, in most cases, sensitivity to shut-in time is impossible to determine from the pressure data available.

EPIC would have the Board believe that the only reasonable conclusion that may be drawn from the pressure data is that every gas pool in Hardy has high permeability and continuity, and wells within the same pool should have similar pressure trends. The SSG contends, however, that a reasonable interpretation of the pressure data is that Hardy is a single pool comprised of several geological sequences with limited vertical and lateral communication between good permeability sands.

The SSG asserts that the evidence tendered by

EPIC in this regard may be interpreted to support either scenario. A good example of this is the scatter plot included by EPIC in its direct evidence [Exhibit I-33, page 3, Pressure for Wabiskaw-McMurray A Pool (SSG CD)] as support for its interpretation of numerous, high permeability pools.

Pursuant to cross-examination, however, EPIC conceded that such scatter could also occur with the SSG's single pool scenario, depending upon the degree of communication between the interconnected geological sequences [Transcript, page 1160.]

EPIC also relied upon a permeability distribution plot for the Hardy Wabiskaw-McMurray A Pool based on well test analyses, and concluded from it that the average in-situ permeability in Hardy gas pools was 500 millidarcies.

The SSG established in its cross of EPIC that this plot was comprised mainly of the short-duration flow tests that represent only the near-wellbore region of the reservoir.

As noted four of the five longer-duration tests examined by Fekete showed significantly reduced permeability away from the wellbore. Contrary to Fekete's conclusion, none of the longer flow and build-up test analyses interpreted no-flow boundaries. Since Fekete was unavailable for questioning on this issue, the SSG asserts that the Board should rely on the actual test analyses conclusions.

The SSG argues that these tests indicate that the further you investigate into the reservoir, the greater the variation in reservoir quality.

The SSG contends that these tests directionally lend more support to the RGS and SSG interpretation of a complex, interconnected reservoir.

However, it remains the SSG's position that the pressure data is too limited and simplistic to be useful in pool delineation.

The SSG submits that the core permeability data is also very limited, and is not representative since it is typically sampled in the better-quality bitumen pay zones. The SSG contends that this data tells you nothing about the lateral continuity within gas pools and thus cannot be relied upon as support for EPIC's multi-pool model.

Paramount's material balance plots show that 81 per cent of the Hardy reserves are in pools exhibiting non-linear behavior. This fact, and EPIC's use of a dual-tank model to explain delayed pressure re-charge, contradicts its premise that the Hardy gas pools have high permeability and good continuity.

The SSG contends that EPIC failed to properly match pressure scatter with its simplistic two-tank model and ignored the requirement to use as many tanks as needed to duplicate significant pressure scatter.

The SSG asserts that EPIC's failure to use the dual tank model on its 7 "scatter" pools further undermines the credibility of this method.

It is the SSG's opinion that the wide variation in well decline trends within Paramount's gas pools reflects poor connectivity and variable permeability. The SSG argues that the variety of well decline rates in Hardy is a reflection of localized reservoir quality and pressure rather than high permeability and good continuity.

As noted by EPIC on page 1279 of the transcript, in a poorly connected reservoir, the localized pressure in each area will depend on the cumulative production relative to the reservoir tank size in that area.

Since production may be lower in areas where the permeability is poor or where there is water loading in the wellbore, those areas might be expected to have higher pressures than other areas.

The SSG observes that under these conditions pressures may take several years to equalize after the whole system is shut in.

The SSG submits that if Paramount's interpretation of high permeability and good continuity is wrong, then there is no basis for its assumptions that large pressure gradients cannot exist within the Hardy Wabiskaw-McMurray A Pool, nor for its assumption that the measured pressures are stabilized.

As a result, the SSG contends that pressure trend analysis becomes unreliable as a tool for pool delineation.

EPIC stated it used an integration of the geological, geophysical and engineering information to make its interpretation of the gas accumulations in the Hardy Field. However, it did not use its own geological interpretations, but rather adopted the RGS stratigraphy, and accepted the RGS interpretation of the basal gas contacts.

It is the SSG's view that Paramount did not consistently employ the available geological and geophysical information, and that the Board should not consider its study to be integrated in this regard.

Cross-examination of EPIC revealed that where discrepancies arose between conclusions based on pressure data and conclusions based on geological or geophysical data, EPIC relied upon the pressure data [Transcript, p.1188 and p.1197.] For example, EPIC stated that it applied a 4-metre tolerance associated with gas water and gas oil contacts to make its pool interpretations in the Hardy Field.

However, EPIC admitted that it had exceeded its tolerances within its pools, at times by up to 16.5

metres. [Transcript, p.1198 and p.1199.]

EPIC explained that the tolerance was exceeded because it noted pressure communication.

As a further component of its integrated approach EPIC used 2-D seismic "bright spots" to support its pressure based pooling conclusions, but did not provide an expert witness to speak to its seismic interpretations.

For this reason alone, the SSG contends that the Board should give the seismic evidence provided by EPIC and Paramount no weight at all. However, should the Board decide to consider this evidence the SSG contends that it is generally not supportive of EPIC's pressure based pooling conclusions and in fact contradicts other aspects of the integrated approach such as drained initial pressures [Transcript, p.1214-1223] or calculated volumetric reserves [Transcript, p.1184 and p.1185.]

Under cross-examination EPIC agreed that there were significant seismic breaks within its mapped pools and negligible seismic breaks between adjacent pools.

On page 1217 of the transcript, EPIC stated that the lack of a seismic bright spot in the middle of a mapped pool could be indicative of poor permeability within the pool itself. If this is true, then the SSG argues that the lack of a seismic bright spot between the EPIC mapped pools may also be indicative of poor permeability sections within a large pool.

EPIC's integrated approach included a comparison of decline reserves, material balance gas-in-place, and volumetric gas-in-place. Eight of the 24 pools for which a material balance was calculated have ratios of material balance to volumetric gas-in-place greater than 1.5, and even within EPIC's high-confidence or reasonably-high-confidence pools the ratio varies from 0.51 to 2.51 [Transcript, p.1793, p.1794-1800, and p.1801].

In fact, when asked to explain the discrepancy between decline reserves and volumetric reserves in Pool E7511, EPIC stated that volumetric reserves are not reliable in this area [Transcript, p.1797.]

Another problem in comparing volumetric to material balance reserves is that EPIC did not do any geological work of its own and instead relied upon the RGS values for net pay.

As the SSG understands it, EPIC's pool edges were based largely on its pressure review. Further the SSG understands that EPIC created large areal net pay maps of the Wabiskaw C, A1 and McMurray channel sands, based on the RGS net pay values, and then used its pool outlines like cookie cutters to obtain the volumetric reserves in each layer of its pool [Transcript, p.1252].

As EPIC's volumetric reserves were not based on an independent geological review, the SSG argues that its use as a method of validating the material balance reserves is questionable. The SSG contends that as long as you divide up the RGS-based gas reserves so that the well's drainage volume is roughly accounted for, you might expect a rough agreement between the volumetric, material balance, and decline reserves. [Transcript, p.1252 and p.1253.].

Another facet of EPIC's integrated approach was its use of individual well production decline signatures to support its pooling. During the hearing, EPIC conceded it no longer viewed comparisons of individual well declines to be useful in validating pooling, due to operational influences. However, EPIC contended that differences in pool decline rates supported separate pooling.

The SSG submits that EPIC's contention that pool decline analysis supports its high permeability multi-pool model has little merit because any combination of the widely varying well declines is likely to generate widely varying pool declines that would suggest alternate pooling.

Essentially, as the SSG understands it, EPIC wants the Board to ignore differences in well declines within its pools, but accept differences in pool declines as a method of validating its pooling. The SSG notes, in that regard, that during its cross-examination of EPIC, the SSG demonstrated that four wells selected from four different pools that span a township, all had similar decline trends that appear to track one another both up and down. [Transcripts, p.1279-1282].

The SSG submits that such close tracking pool declines are most likely an artifact of the gathering and compression system and is not reflective of common pooling.

Essentially, sir, it's the SSG's position that the Board was correct in Decision 2004-045 when it found that insufficient data was available to use pressure to determine pooling. Problems in the Wabiskaw McMurray A Pool in terms of quality and quantity of data -- there are problems in the Wabiskaw McMurray A Pool in terms of both quality and quantity of data.

Further, the SSG asserts that the integrated approach utilized by EPIC is suspect because they only utilized data that agreed with its pressure conclusions and disregarded data that disagreed with its pressure conclusions.

Having said that, sir, however, it's the SSG's position that the Hardy study performed by EPIC is largely irrelevant. EPIC made production status recommendations for the pools it interpreted to exist in Hardy. EPIC broadly classified these pools into four categories and recommended that cases 1 to 3 should be allowed to produce while case 4 wells should be shut in based upon the then existing regulatory requirements.

However, the SSG observes that EPIC's production recommendations were predicated upon the adoption of GIAG criteria for commercial bitumen for the assessment of potentially recoverable bitumen and the abandonment of the accommodation space principle.

Arguments proposing the use of commercial criteria, including GIAG's, to determine potentially recoverable bitumen were considered and dismissed in Decision 2003-023 and the ID 99-1 criteria for determining potentially recoverable bitumen was retained. [EUB Decision 2000-23, s.4.2, p.12].

GB 2003-28 confirmed the Board's use of these criteria while emphasizing the need to consider bitumen recovery using future technology under different economic circumstances. [EUB GB 2003-28, Appendix 1].

In the Phase 3 Interim Hearing, this issue was raised again along with the SSG's use of accommodation space in the highly variable McMurray. After considering arguments on both sides of the issue, the Board's Decision 2004-045 continued to use the 10-metre and 50 percent bitumen saturation criteria, and also accepted the use of a 20-metre minimum accommodation space criterion. [EUB Decision 2004-045, s.5.1, p.5-6]. EPIC provided no justification for this radical shift in criteria and led no evidence to support its adoption.

Should the Board determine that its definition of potentially recoverable bitumen and the use of accommodation space remains appropriate, then based upon the EPIC study results, case 2, 3 and 4 gas intervals are associated with potentially recoverable bitumen and should remain shut in.

Should the Board determine that the Wabiskaw D shale is not a regional sealing mudstone, as advocated by both the SSG and Nexen, then based upon the EPIC study results, the majority of case 1 gas intervals are also associated with bitumen and should also remain shut in.

The SSG asserts that lateral isolation between gas pools in Hardy is largely irrelevant if all of those pools remain associated with potentially recoverable bitumen.

Which leads me to my next topic, sir, which is potentially recoverable bitumen.

In Decision 2004-045, on pages 4 and 5, the Board referenced ID 99-1 which defined potentially recoverable bitumen as:

> "...bitumen in oil sands that has a minimum thickness of 10 metres with a minimum bitumen saturation of 50 percent. Consideration must be given to the volume of the bitumen encountered,

> the geological depositional environment, the presence of associated water zones, and the available well control."

With respect to the minimum bitumen saturation requirement, the Board found on page 5 of Decision 2004-045 that the RGS regional bitumen pay map that was based on a 6 weight percent cutoff serves as an adequate proxy for a map based on 50 percent pore volume. The SSG continues to believe that the 6 weight percent cutoff is an appropriate proxy for 50 percent pore volume.

While the ID 99-1 definition may have been appropriate for the purposes of determining what gas was associated with potentially recoverable bitumen in the interim proceedings, the SSG contends that the expanded definition or explanation of the term, as found in GB 2003-28, should be referenced by the Board when determining the final production status of gas wells and intervals in the RGS area. The expanded definition includes the following paragraph that is not included in ID 99-1:

> "The EUB's conservation mandate inherently requires consideration of the long-term development of bitumen resources. Current commercial in situ technologies in the Athabasca Wabiskaw

> McMurray are new and developing, therefore, these schemes do not define potentially recoverable bitumen. The EUB must also consider the bitumen resource that is exploitable with reasonably foreseeable technology and economic conditions. For example, the EUB expects that existing projects will develop lesser quality resources as they expand."

In the SSG's view, the emphasis on future bitumen recovery in this passage is reflective of the Board's fundamental mandate to manage risks to the conservation of Alberta's energy resources in the face of uncertainty.

In Decision 2004-045, the Board confirmed the appropriateness of incorporating the concept of accommodation space into its determination of what constitutes potentially recoverable bitumen. The Board stated the following on pages 5 and 6 of that decision:

> "The Board accepts that the concept of accommodation space provides a reasonable interpretation of the potential for bitumen to exist in sands deposited in a fluvial/estuarine setting where the existing well control

> is insufficient to closely define the extent and thickness of the sands. The Board accepts that where channel deposits have the potential for bitumen thicknesses of greater than 20 metres to occur, i.e., accommodation space, while having less than 10 metres of net bitumen in the wellbore, a significant degree of risk to potentially recoverable bitumen is likely and the associated gas intervals should be shut in.
>
> The Board is satisfied that given the existing drilling density, the nature of the sediments containing the bitumen, and the need for conservation, it is necessary in some cases to protect bitumen that is not clearly identified but is nevertheless expected to exist in the channel deposits."

The Board further observed that, at the time of the interim hearing, participants were concerned that insufficient opportunity had been provided to test this new concept. The SSG notes that no party in this final proceeding provided evidence to challenge the appropriateness of the Board's adoption of the concept of accommodation space. As such, the SSG argues that the use of 20 metres of accommodation space as a cutoff for McMurray channel sands should be confirmed as an essential component of the definition of potentially recoverable bitumen.

The SSG contends that the Board should continue to apply the GB 2003-28 definition of potentially recoverable bitumen to both the McMurray and the Wabiskaw B valley fill.

With respect to potentially recoverable bitumen in the McMurray, the SSG notes that no party to this proceeding has provided evidence to support the adoption of new or different criteria in this zone.

While the SSG acknowledges that the EPIC production status recommendations contained in Paramount's February 14, 2005 submission were largely premised on the use of GIAG criteria, the SSG observes again that no supporting data was provided to support such a radical shift in conservation policy.

Further, neither CNRL nor ISH challenged the appropriateness of applying the GB 2003-28 definition of potentially recoverable bitumen for the McMurray.

With respect to the Wabiskaw B valley fill, ISH and CNRL stated that reservoirs in the Wabiskaw B valley fill is of similar or poorer reservoir quality than the

Wabiskaw of the Saleski-Ells/Tar area. Both advocated that the 15-metre cutoff that was applied in the Wabiskaw in the Ells/Tar area should also apply to the Wabiskaw B valley fill in the Kirby area.

However, the SSG notes that ISH acknowledged that some of the petrographic data it used for comparison with the Kirby Wabiskaw B valley fill was outside of the RGS study area. [Transcript, p. 712].

Regarding SAGD potential of the Kirby Wabiskaw B valley fill, the SSG considers that bitumen reservoirs at Cold Lake have lithologies, cemented zones, and clay composition percentages that are similar to bitumen reservoirs in the Kirby Wabiskaw B.

In its May 9, 2005 response submission, pages 6 and 7, the SSG demonstrated these similarities and concluded that SAGD is currently operating in reservoirs similar in nature to the Kirby Wabiskaw B valley fill.

The SSG, CNRL and ISH all recognize the common presence of cemented horizons within cores from the Kirby Wabiskaw B; however, these parties have a difference of opinion regarding the lateral extent of these cemented horizons. It remains the SSG's position that cemented horizons within the Kirby Wabiskaw B valley fill are discontinuous concretions that do not create seals.

This is most notably demonstrated by

cross-sections with wells only 15 metres apart, and here I'm referencing the 02 and 00/10-33-073-08-W4 wells, where calcite cemented zones vary in thickness and do not correlate straight across from well to well, and this was described in appendix 5 of the SSG's May 9, 2005 submission.

It is the SSG's opinion that since concretions tend to occur at specific horizons, the probability of intersecting a parallel top and parallel base with a 4-inch diameter core remains high, especially for large flattened concretions that may be several feet in length. As such, the SSG submits that the Board should not consider the cemented horizons as continuous, impermeable seals that break up the bitumen reservoir into compartments and/or separate the overlying reservoirs from underlying bitumen reservoirs.

Neither CNRL nor ISH put forward evidence to show that SAGD is not viable in the Wabiskaw B valley fill. Their only argument is that the thickness cutoff should be increased from 10 metres to 15 or even 20 metres.

The simple simulation run on Wabiskaw B valley fill bitumen performed by CNRL assumed the thickness to be at the cutoff value of 10 metres. [CNRL Submission, February 14, 2005, p. 9]. The SSG argues that the cutoff for protecting bitumen is 10 metres which assumes that there are areas with greater than 10 metres that are being protected. As such, the simulation run by CNRL is inappropriate and insufficient to determine the viability of SAGD in the Wabiskaw B valley fill.

CNRL also argues that the RGS Wabiskaw B valley fill net bitumen pay map is overstating the bitumen resource. The SSG supports the RGS determination of the Wabiskaw B valley fill net bitumen pay based on the use of a 6 weight percent cutoff. As stated in the RGS on page 97, a cutoff of 6 weight percent bitumen is considered to approximate a combined 50 percent bitumen saturation cutoff and a 27 percent porosity cutoff.

The SSG demonstrated in Exhibit M-20 that a 50 percent saturation cutoff generates thicker net pay values. The SSG notes that using a 50 percent saturation cutoff includes intervals irrespective of porosity.

Although CNRL determined the Wabiskaw B Valley-fill median porosity value to be 34 per cent from core analysis [Exhibit C-10.], the SSG contended in its response submission on page 7 that the core analysis overstates porosity and understates bitumen saturation.

As Exhibit M-20 demonstrates, the average log derived porosity in the Wabiskaw B Valley-fill for intervals with greater than 50 per cent bitumen saturation is only 26 per cent.

The SSG argues that, based on this evidence, the Board may safely conclude that 6 weight percent cutoff better represents the average porosity of 26 per cent.

The SSG further argues that the RGS Wabiskaw B Valley-fill net bitumen pay map is supported by the net bitumen pay map prepared by ISH, which shows very similar trends and thicknesses.

Again, the SSG wishes to emphasize that the Boards assessment of potentially recoverable bitumen must not be constrained by what is recoverable with existing technology under current economic conditions.

This is, in effect, what CNRL and ISH are advocating by requesting that the bitumen cut-off be increased to 15 or even 20 metres.

In summary, the SSG believes the Wabiskaw B Valley-fill represents a significant resource and the use of a cutoff greater than 10 metres will put a portion of that resource at risk.

As such, the SSG urges the Board to continue to apply the GB 2003-28 definition of potentially recoverable bitumen to the entire RGS area with the exception of the Wabiskaw in the Ells/Tar area.

By way of clarification, however, the SSG does not believe that the use of accommodation space is appropriate for the Wabiskaw and maintains its position as set out in its January 26, 2004 submission, to the interim proceeding where it was stated:

> "Accommodation space was generally not a consideration in the Wabiskaw because within Wabiskaw Sands and Wabiskaw Valley-fills the distribution of sands and shales and the thickness of the stratigraphic interval are generally more predictable." [EUB Decision 2004-045, p.5]

Moving, now, to lateral continuity of mudstones, based on its core studies of the Wabiskaw D shale, as well as those conducted by Nexen, the SSG asserts that the Board can no longer consider the Wabiskaw D shale as a regional sealing unit for the Athabasca Wabiskaw-McMurray in the RGS study area.

CNRL opposed this argument, stating that the SSG and Nexen core studies were subjective, inconsistent and contradictory [CNRL Reply Evidence, p. 5, 16, 23-25.]

CNRL's assertions in this regard, however, were supported by no evidence.

The SSG asserts that, while its study of the Wabiskaw D shale was based upon different approached from that adopted by Nexen, evidence presented in this proceeding by both parties demonstrates that the two studies are complimentary, rather than inconsistent as purported by CNRL.

The respective core studies were totally independent, but reached the same conclusion, that conclusion is, wire-line logs do not consistently or reliably predict the presence or thickness of the Wabiskaw D shale.

The SSG is confident that during its Wabiskaw D shale core study it identified intervals of lost core within the Wabiskaw D shale and did not include spurious values in its scatter plots of core-thickness versus log-thickness.

Regarding the issue of potential missing core intervals, the SSG asserts that there is no evidence to suggest that the Wabiskaw D shale is disproportionally susceptible to lost core as opposed to other units, such as friable, uncemented water- and/or gas-sands.

Respecting core recovery, the SSG maintains that for unconsolidated sediments the only reliable depth corrections are done on slabbed-cores during core description phases of work [Nexen Response EUB-NEXEN-4 to Board Staff Information Request; Transcript, p. 296-298].

The SSG urges the Board to reject CNRL's proposal that evaluations of the sealing capability of the Wabiskaw D shale should be done on a pool-by-pool basis.

The SSG notes, in that regard, that the core data necessary to support such an evaluation is simply not available.

Further, the SSG has submitted pressure analysis in its February 14, 2005 submission indicating that for areas even where the Wabiskaw D shale appears to be more correlatable it is not an effective seal [SSG Submission, p. 16, Appendix 5].

Notwithstanding the uncertainty of the Wabiskaw D shale to be an effective seal, the SSG submits that the RGS remains the most reliable and comprehensive body of evidence the Board has to make determinations regarding gas association with potentially recoverable bitumen.

The SSG maintains that the McMurray A2 and McMurray B2 mudstones, where present throughout a region of influence, separate underlying bitumen from the effects of depleting the overlying gas zone.

I will now move on to the effects of associated gas production on SAGD bitumen recovery based on reservoir modeling.

Of all the participants in this proceeding, only one, Paramount, has asserted that the production of associated gas presents no risk to the recovery of underlying bitumen.

Paramount applied to change the production status of 203 wells/intervals that were shut in pursuant to the interim proceeding. All of these wells/intervals are identified by the SSG as being associated with potentially recoverable bitumen.

In support of its position, Paramount developed three-dimensional geostatistical models that it claims better describe the McMurray reservoir than models presented in the past. It claims to have tested this model by history matching gas production.

Paramount extracted six two-dimensional slices on which to perform SAGD simulations and claims that these six slices represent every variation in sand and fluid configuration likely to be encountered in the McMurray.

Paramount also performed sensitivity runs by improving the quality of the lower portion of the McMurray interval.

Finally, Paramount set aside its geostatistical model and ran SAGD simulations on a homogeneous sand model to demonstrate what impact top gas pressure would have on bitumen recovery.

Based on the cross-examination of Paramount regarding its modeling work, the SSG submits that: Paramount's geostatistical models do not accurately represent the McMurray reservoir; that Paramount's history match was flawed and does not support its geostatistical model; that Paramount's 2-D SAGD models do not provide information regarding the impact of top gas pressure on ultimate bitumen recovery; and that Paramount's 3-D SAGD models are significantly flawed.

As a result, the SSG asserts that Paramount's modeling studies cannot be relied upon by the Board when assessing the uncertainties associated with associated gas production and it was not helpful in determining whether associated gas production represents an unacceptable risk to potentially recoverable bitumen. I will address each of those issues in more detail.

Paramount states that its geostatistical 3-D models have incorporated representative geology and representative levels of heterogeneity and that the models preserve the spatial configuration of both the facies and the petrophysical properties within the five pools it modeled.

Paramount further states that SAGD performance is controlled dominantly by geology, facies and the associated petrophysical properties and that porosity and permeability, within each of those facies have a very significant impact on flow simulation results.

The SSG agrees that geology, facies and petrophysical properties are important aspects that can affect SAGD performance. However, the SSG contends that these geostatistical models do not incorporate representative geology or preserve the spatial configuration of facies and petrophysical properties as Paramount claims.

Paramount used its logged core data and

pseudo-core data generated from discriminant analyses as control points in its model. Paramount then chose a geostatistical method based on cell-based indicators to model facies distributions to populate grid cells in the model away from their control points. Exhibit M-29 which is an outcrop photo of the McMurray Formation clearly show discrete objects [Exhibit M-29, SSG annotated version of Paramount's Exhibit I-30, slide 14], such as channel-fills, at scales that are larger than the model grid blocks, that were 50 metres by 50 metres by 1 metre.

The SSG contends that such outcrop heterogeneities should be modeled by synthesizing detailed, measured outcrop heterogeneities and using a geostatistical object-based method [Exhibit I-8, p. 1263], rather than arbitrarily assigning ranges of facies variograms in an iterative fashion as was done by Paramount [Transcript, p. 1701-1702; 1745-1746].

The results from Paramount's modeling show smeared patterns of facies or "pixelated mosaics" that bear no resemblance to Paramount's own outcrop photos of the McMurray Formation [Exhibits K-18, K-20].

In addition, when grid cell values were populated with simulated values of porosity, volume shale, and water saturation, a technique called colocated cokriging was used by Paramount. Paramount agreed that this technique can artificially introduce extra variability in geostatistical simulations [Transcript, page 958].

Paramount stated that the Petrel software it used incorporates a cokriging variance reduction factor, and noted that it normally uses this function when it runs models [Transcript, Page 959]. This suggests to the SSG that Paramount was aware that this is an important consideration when performing collocated cokriging.

Under cross-examination Paramount stated that it was able to conclude that variance was not an issue by cross-checking its results with its input data [Transcript, page 958,959].

However, in Exhibit I-36, Paramount stated that that it did not perform a cokriging variance reduction as this was not warranted after examining the output data.

It is thus unclear on what basis Paramount concluded that variance reduction was unnecessary. What is clear is that variance reduction was not performed even though Paramount confirmed it is its normal practice to account for variance when it runs its models.

The SSG argues that there is a real possibility that this effect was introduced and went undetected and uncorrected. As such, the SSG argues that this could introduce unknown errors in shale volumes and water saturations and in turn create uncertainty in the simulation results.

Paramount claims that geostatistical models generate the probable facies distribution that would occur between the existing wells in the pool. However, the 28 wells in the modeled gas pools were drilled for the purpose of extracting gas and not for the purposes of determining the spatial configuration of the various facies within the complex McMurray channel environment.

Despite this apparent limitation, Paramount deems that the data from these few gas wells can be relied upon to evaluate the statistical probability of any particular facies occurring vertically [Transcript, p. 1003.]

The SSG observes that Paramount's argument in this regard is circular. Paramount populates each model using only the data from the wells that penetrate the given pool. The gas well data going into the model consists of muddy intervals in the upper portions of the McMurray and poor bitumen reservoir quality in the lower portions of the McMurray.

It is not surprising then, that the resulting 3-D models tell us that the muddy interval is persistent and there is generally poor bitumen reservoir quality.

When asked why the data from offsetting wells were not used in the sampling process, Paramount claimed that McMurray geology changes very quickly and that analysis must be done on a pool-by-pool basis [Transcript, p. 1773 1774]. Essentially, Paramount wants to have its cake and eat it too.

The SSG argues, however, that the few wells within the pools do not statistically represent the various vertical and lateral facies distributions that are present in the McMurray.

The SSG demonstrated this in Exhibit M-25, illustrating the numerous wells in an area immediately adjacent to the modeled pools where clean sand facies occur in the upper portion of the McMurray interval. In many of these wells, there is no muddy interval between the bitumen and overlying gas and water zones. As a result, the SSG urges the Board to conclude that the 3-D models have not incorporated representative geology.

Paramount relied on the log and core data from only 10 wells to develop its discriminant analysis function. It defined seven facies, each having distinctly different petrophysical characteristics [Transcript, p. 1762].

However, the discriminant analysis scores indicate that the process Paramount applied misclassifies the facies 40 percent of the time. [Paramount IR Response, April 11, 2005, Response SSG-PEOC-04, Discriminant Scores Attachment].

The SSG submits that by not being able to discriminate between facies based on the log data, the log parameters that come out of the analysis for each facies are not distinct. If the facies were petrophysically distinct, it would be possible to see the facies imprint over the porosity model.

If we look at any one of the 3-D pictures of the facies realizations, we can see that each facies is clearly identified and the various lateral and vertical extents can be visually mapped out. However, because the porosities associated with each facies are not distinct, it is difficult to see any match between the facies distribution and the porosity distribution.

The SSG argues that using Paramount's approach, porosity distribution in the model becomes more heterogeneous, and the facies geometries are lost. The facies distinction becomes irrelevant.

As a result, the SSG argues that the 3-D models have not incorporated representative levels of heterogeneity. The SSG argues that the reservoir properties that populate the model are now so heterogeneous that the unique facies distributions that occur in the McMurray are no longer represented.

Building upon the errors inherent in the previous two steps in the model building process, Paramount populated the model with permeability values derived from a core porosity to permeability transform based on log-derived porosities. [Transcript, p. 1373].

Over the course of the proceeding, Paramount provided four different data sets as the source for this transform which gives rise to significant uncertainty as to what data set was actually used.

Paramount agreed that core-derived porosities are generally higher than log-derived values for the same interval. [Transcript, p. 1039]. It also accepted that porosity and permeability was measured under overburdened conditions. [Transcript, p. 1376-1377]. And yet, Paramount did not attempt to adjust the log-derived porosities to the equivalent core porosities before solving for permeability.

As illustrated by the SSG, the horizontal permeability values derived from this transform are low. [Transcript, p. 1042].

Further, the vertical permeability values in the model are subsequently derived from the horizontal permeability values and must therefore also be low. As a result, the SSG urges the Board to conclude that the 3-D models do not accurately represent the horizontal and vertical permeability of the McMurray formation. The SSG emphasizes that these are key components that influence fluid flow.

Paramount suggests that it calibrated the geostatistically generated 3-D model by attempting to history match the gas pool production.

First, the SSG argues that there was insufficient data to effectively perform a history match. The SSG considers that this point was amply demonstrated by Petro-Canada's cross-examination on this issue.

Second, even if the Board accepts that sufficient data was available to perform an effective history match, the SSG observes that Paramount was unable to get a match to the 3-D model because there was insufficient gas in the model. Paramount indicates that modifications to the reservoir description were required to match the historical production data.

Specifically Paramount noted that water saturation estimates within the A1 sand were uniformly reduced to 19 percent, which is characteristic of a high porosity, fine grained, and well sorted sand. However, this description of the A1 sand is inconsistent with Paramount's description of a marine sand which it describes as bioturbated with a muddy component. [Transcript, p. 826, 887, 1018, 1019].

Perhaps Paramount was correct when it compared the McMurray gas volumes from decline values to the model volumetrics. It stated in Volume 1, page 41 of its February 14, 2005 submission that "The poor match implies that the model does not have enough sand within it. For example, wells have not penetrated a thicker McMurray sand that exists, so therefore it was not modeled." This is exactly the point the SSG is trying to make.

The SSG argues that the insufficient gas volumes and the inability to achieve a history match demonstrate that the geostatistical models do not accurately represent the porosity and saturations of the McMurray.

In selecting the 2-D slices from the 3-D geostatistical model on which to conduct its thermal flow simulations, Paramount centered the slices on existing gas wells. This is in spite of the fact that its 3-D model indicated that better quality bitumen reservoirs could be found at other locations.

It is the SSG's opinion that the value of generating a 3-D model is that it will interpolate between the existing well data and predict the quality of the reservoir.

The SSG argues that if the premise of these flow simulations is to determine impact on SAGD performance, flow simulation studies are most appropriately conducted where the 3-D model predicts better quality reservoir. By running the flow simulations at the existing well locations, the SSG questions why a complex geostatistical model is required at all.

As a result, Paramount has tested SAGD

performance within areas of lesser reservoir quality than predicted by the model. Not surprisingly bitumen recoveries from these models are poor.

Notwithstanding the shortcomings of the 3-D geostatistical geologic model, Paramount's 2-D flow simulation models demonstrate that steam breakthrough to overlying gas zones would occur in heterogeneous reservoirs. The 2-D flow simulation in the original reservoir description at the 6-27-81-9W4 well of the Corner McMurray G Pool demonstrates that steam will rise through the heterogeneous McMurray reservoir and break through to the overlying gas zone.

The SSG asserts that the approach used by Paramount using geostatistical methods to generate 3-D geological models does not account for the limitations of its 2-D SAGD simulation models in which all the heterogeneities must be a minimum of 50 metres in the XZ plane and 500 metres in the Y plane along the SAGD well pair.

The SSG submits that the unrealistic lateral extent of heterogeneities or flow baffles in Paramount's 2-D models limits steam rise and gravity drainage. The SSG submits that the impact of this is that Paramount's 2-D models underpredict SAGD recovery performance.

The SSG submits that the exaggeration of the lateral extent of flow baffles in the XZ plane is clearly shown in the SAGD simulation submitted by Paramount for the Hangingstone KKK Pool. In this SAGD model, the lateral extent of the heterogeneities is 70 metres and, in fact, extends across the entire width of the model which is for a full well-pair. Paramount agreed that steam has no opportunity to flow around these baffles and this will negatively affect SAGD recovery performance. [Transcript, p. 1058].

Under cross-examination, Paramount agreed that exaggeration of the lateral extent of flow baffles in Paramount's 2-D models is even greater in the Y direction along the 500 metre long well pair. Paramount acknowledged that the use of 500 metre heterogeneities was not intended to reflect observed or real world conditions, but was simply a function of the 2-D model. [Transcript, p. 1060].

With the of exception of the 6-27 original reservoir run and the 3-34 sensitivity model run, the steam chamber did not break through to the overlying gas zone in Paramount's 2-D models [Transcript p. 1079]. However, no performance data after breakthrough for these two wells was presented in Paramount's submission.

Paramount agreed that if the steam chamber does not break through to the overlying gas zone, there will be no effect on SAGD operations irrespective of the gas zone pressure [Transcript p. 1080].

As a result, the SSG argues that Paramount's 2-D models do not provide an assessment of the effect of gas cap pressure on SAGD operations. Rather these simulations simply show whether the steam chamber will break through to the overlying gas zone under the geological conditions input into the model.

Finally, and perhaps most importantly, no SAGD history matching has been done to validate Paramount's 2-D models. The SSG submits that this is the critical information needed if the Board is to revisit its previous conclusions regarding SAGD modeling.

Paramount acknowledged that you would typically use history matching in a flow simulation to validate the geology and agreed that no SAGD history matching has been done to validate its geological model [Transcript p. 1075, 1076]. Paramount contends that the history match of the upper zone gas depletion provides some validation of its SAGD models.

The SSG submits that history matching production from a gas pool in no way validates Paramount's 2-D models since it is not analogous to history matching bitumen production from a SAGD well pair.

In any event, the SSG notes that Petro-Canada clearly demonstrated that an effective or appropriate history match of the upper gas pools was not obtained in its cross-examination of Paramount.

Paramount submitted homogenous 3-D SAGD models for a generic, high-quality reservoir in an attempt to demonstrate that overlying gas pressure has no impact on ultimate bitumen recovery.

Based upon cross-examination of the Paramount panel, the SSG demonstrated that these model runs are seriously flawed, and the results generated should be disregarded by the Board. Under cross-examination, Paramount agreed that the results for its simulation run 3.1A-1900 show that the bitumen rate and instantaneous SOR were unstable or fluctuating [Transcript, p. 1096, 1097].

Paramount stated that it conducted other runs to test different sensitivities but did not attempt to determine the cause of the instability or fluctuations of its model run.

Given the instability in the instantaneous SOR, the SSG submits that it is not possible to determine when the SAGD well pair becomes uneconomic which significantly limits the usefulness of Paramount's 3-D models. In that regard, Paramount stated that it would look at the cumulative SOR to determine the economic cutoff for a SAGD well pair.

The SSG argues that this view is clearly not in accord with that of bitumen producers as is reflected by the fact that the Firebag project, the Mackay River project and the Surmont project all use an instantaneous SOR cutoff to determine when a SAGD well pair becomes uneconomic.

Paramount's 3-D model predicted average bitumen production of 40 m3 per day, a rate that the SSG argues is inordinately low given the reservoir characteristics input into the model.

The SSG also contends that this rate is unrealistic when compared to real production data from SAGD projects such as the UTF Phase B pilot, which utilized the same well length and spacing as the Paramount model.

The Yee and Stroich paper reported that the UTF pilot has heterogeneities, facility interruptions, and less net pay, yet had an actual field bitumen production rate of 100 m3 per day per well pair with a production curve that was significantly smoother than that produced by the model run demonstrated by Paramount. [Exhibit M-27].

In comparison, Paramount's homogeneous dream channel achieved bitumen production rates of approximately 40 m3 per day per well pair with the bitumen rate and instantaneous SOR fluctuating erratically. Paramount modeled what, in theory, is a far better reservoir than what occurs at the UTF but achieved far poorer production rates. Paramount indicated that a comparison of the two projects could not be made because the geology is so different.

The SSG agrees. The dream channel geology is much better than that at the UTF and therefore should have yielded better results. Given the low bitumen rates together with the instabilities in the simulation output data, the SSG submits that these results clearly indicate that there are serious flaws in Paramount's 3-D model.

Notwithstanding the significant concerns identified with respect to the validity of the 3-D models, the SSG submits that the output data from these models still show that thief zones will have an effect on SAGD operations.

Paramount's simulation run 3.1A-1900 had a target injection pressure of 3000 kPaa, but Exhibit I-36 shows that the steam chamber pressure was much lower for a considerable time regardless of whether the 2003 or 2005 version of the Exotherm simulator is used. Paramount conceded that this fall in steam chamber pressure to the pressure of the overlying thief zone occurred when the steam chamber developed pressure communication with the thief zone. [Transcript, p. 1147]. The SSG argues that this clearly represents an impact on SAGD operations and that the scope of that impact will depend on the thief zone pressure encountered.

The SSG contends that if a SAGD project needs to operate at lower pressure as a result of encountering a thief zone, this will decrease its operating flexibility and increase the risk to SAGD recovery.

Although Paramount did not accept that low steam chamber pressures of 600 kPaa or 200 kPaa increased the risk of successfully operating a SAGD project, it did acknowledge that the lowest steam chamber pressure demonstrated in a field project was 1000 kPaa. [Transcript, p. 1123].

Paramount further acknowledged that industry continues to look for technical solutions to operate SAGD at low pressure. [Transcript, p. 1110].

Further, the SSG submits that runs 3.1A-1900PM2 July 17 and 3.1B-600PM2 July17 clearly show that the pressure of the overlying gas zone will have a significant impact on SAGD performance and ultimate bitumen recovery.

The well indices for these runs were calculated by the Exotherm program rather than being manually set. The SSG notes that the bitumen production rates are still low for such a homogeneous reservoir suggesting that the model is still flawed.

However, the instantaneous SOR trends for these two runs are much smoother, i.e., they gradually increase with limited fluctuations, than those for runs 3.1A-1900 and 3.1B-600 making it possible to determine when the SAGD well pair becomes uneconomic.

Using an economic SOR cutoff of 4.5, as discussed on page 77, Volume 3 of Paramount's February 14, 2005 submission, shows that reducing the gas zone pressure from 1900 kPaa to 600 kPaa will result in approximately a 6 percentile reduction in ultimate bitumen recovery [Transcript, p. 1841, 1842].

The SSG submits that over the life of a SAGD project, which can produce upwards of 100,000 barrels a day, such a reduction in ultimate bitumen recovery would be substantial.

On page 5 of the cover letter to Volume 1 of Paramount's submission, Paramount states:

> "Clearly Paramount's current work supports conclusions that are not consistent with results from previous simulation efforts by other parties. It is our view that a detailed review of and a comparison between the different geological and flow simulation models will in all likelihood reveal why these different conclusions exist."

Despite the fact that Paramount states such a comparison between the different models will in all likelihood reveal why these different conclusions exist, Paramount did not submit this comparison, and did not say who should be responsible for conducting this comparison.

The SSG submits that the Board should not deviate from its original decisions based on Paramount's simulation work which has not been compared to previous work and even though seriously flawed, still show that overlying gas zone pressures will have a significant impact on SAGD performance and ultimate bitumen recovery.

In its direct evidence, Paramount made reference to four public documents from which it selected quotes to support its models. The quotations relied upon by Paramount provided none of the background information, or context, necessary to determine whether any analogy can properly be drawn between its modeling conclusions and the projects referenced.

Paramount had no involvement in the generation of the materials it referenced, selected only those quotations that supported its modeling conclusions, and omitted, inadvertently or otherwise, reference to other passages from the public materials that contradict its conclusions.

The SSG questions both the relevance and the reliability of the quotations referenced by Paramount and suggests that the Board give no weight at all to these quotations when assessing the validity of Paramount's modeling conclusions.

The SSG submits that for the Board to allow associated gas production to proceed on the basis of Paramount's models, it must be persuaded that future bitumen recovery will not be compromised. To do otherwise would represent an unacceptable risk to Alberta's most significant energy resource.

The SSG contends that far too many significant uncertainties still exist. These uncertainties were acknowledged by Paramount's own modeling expert who when asked if it was still his position that overlying gas pressure does not impact SAGD performance and ultimate bitumen recovery he responded, "Yes, within the uncertainties" [Transcript, p. 1861].

Finally, sir, I'll move on to policy issues. By way of clarification, the SSG wishes to emphasize that its pressure monitoring proposal is quite different and separate from that proposed by Petro-Canada.

The SSG submits that the ongoing segregation testing required by the Board in Decision 2004-045 can only properly be done using the method set out in the SSG's response to EUB-SSG 11(a) and (b). The SSG believes that operators who choose to produce wells that also encounter shut in gas zones have a responsibility to ensure ongoing segregation.

The essence of the SSG proposal is that zones within the Wabiskaw-McMurray in the RGS area have too little separation to allow the packer to be pressure tested.

The typical separation distance between shut in and producing perforations ranges from 0.5 metres to 3 metres. This small distance is also responsible for increasing the likelihood that there is communication behind casing, and is too short a distance for cement bond log resolution.

The SSG believes that the requirement for ongoing segregation is too critical an issue to be left to the Board's more generalized regulations on segregation testing for multi-zone completions as described in section 11.150 of the Oil and Gas Conservation Regulation.

The second part of the SSG proposal deals with zonal abandonment. The SSG would like to clear up what may be a misunderstanding of its position. The SSG does not believe that zones approved for production should be left un-segregated from shut-in zones, even if neither gas pool is producing. The SSG does not advocate zonal abandonment but prefers zonal segregation and ongoing testing.

However, a responsible alternative to its proposal is to abandon one or both zones. The SSG strongly disagrees with CNRL's proposal to allow zonal abandonment using bridge plugs [Transcript, p.673 and p.674]. In the

SSG's view, a bridge plug is no different from a packer in that it cannot be pressure tested, and communication behind casing is not affected by it.

The SSG does not accept that a properly conducted cement squeeze is less effective than a bridge plug. To the contrary, a cement squeeze is not complete until it has been successfully pressure tested to ensure it is effective.

If it fails the pressure test, additional squeezes are required. The SSG argues that an effective cement squeeze will ensure no ongoing zonal communication in the wellbore or behind casing.

Further, the SSG considers that a cement squeeze does not preclude re-entering the zone at some time in the future and re-perforating.

Petro-Canada is advocating on-going pressure monitoring to further understand the reservoir continuity issues. It recommends one permanent downhole gauge for continuous pressure monitoring in each gas pool and annual static gradients for all remaining shut-in gas wells/zones.

The basis for this request is the potential for relatively thin mudstones to be breached by faulting.

The SSG notes that gas and bitumen producers in the Surmont area established a pressure monitoring program through the technical solutions committee where the Board did not rely on regional barriers and shut-in all the gas.

In the Chard Leismer Decision regional mudstones were relied upon to allow certain gas to continue production. Assuming the Board continues to rely on mudstones or shales as regional barriers, and recognizing the complexity of Wabiskaw-McMurray geology, and the difficulties in resolving pooling, the SSG believes that on-going pressure monitoring has merit. Such monitoring would assist the Board in evaluating mudstones as regional barriers.

It should also help resolve gas pooling, which is necessary to ensure all wells contributing to pressure depletion in a given associated gas pool are shut-in.

The SSG recognizes that the details of such a program would need to be worked out. The most effective way to ensure timely implementation of such a program, in the SSG's opinion, is for the Board to mandate a timeframe and process for consultation on its design. This would be similar to what the Board did respecting ID 99-1 following the Inquiry [ID 99-1].

The SSG believes that it would be prudent for the Board to require an ID 99-1 application for wells with gas intervals given a produce status as a result of this proceeding, but have never produced and/or been completed.

The SSG submits that this would allow for the assessment of data collected subsequent to the completion of the interval, along with any additional data that may have been collected since the completion of the RGS, for example, newly drilled wells and additional pressure tests. Given the complex geology in the RGS area, such an approach is essential to ensuring appropriate gas production decisions, both past and future, as more new data becomes available.

The Board asked each participant its view respecting technical solutions. The SSG accepts that effort on technical solutions is important and may ultimately find a way for both gas and bitumen to be produced. But we have not reached that point today.

The SSG observes that following the Board's decision at Surmont, which precipitated a compensation agreement, the technical solutions committee formed. The SSG does not believe the technical solutions forum can replace Board decisions, indeed it could be argued that Board decisions may act as the catalyst for technical solutions.

If or when a technical solution is identified it will likely be brought to the Board for consideration. The SSG believes that a technical solution will likely be multifaceted. For example, repressuring of a depleted gas zone may be shown to be technically feasible but it may also be necessary to show that it is practical and economic and that subsequent SAGD operations are not impacted.

Further, solutions that can be scaled up for policy purposes will need to demonstrate they are effective in different geological settings.

Today, work is underway in a number of areas but at this time nothing appears to be ready for incorporation into Board decisions on the gas over bitumen issue. The SSG submits that the Board cannot assume that work underway is sufficient to mitigate the risk to bitumen conservation.

As the SSG sees it, the Board must make three basic determinations when considering the production status of the wells and intervals at issue in this proceeding: First, it must determine what risk is associated with the production of gas associated with potentially recoverable bitumen? Second, it must determine what bitumen should be defined as potentially recoverable; and third, it must decide which gas pools are associated with potentially recoverable bitumen?

As noted earlier the Board described its challenge in this process as one of managing risk in a fair and responsible way until such time as uncertainties can be reduced or eliminated.

The SSG continues to be of the view that significant uncertainties remain with respect to each of these determinations. To appropriately mitigate these uncertainties, the SSG contends that the Board should continue to err on the side of caution.

The SSG's production status recommendations, as detailed in its prehearing submissions, reflect a precautionary approach to bitumen conservation. The SSG hopes that these recommendations will assist the Board in its final determination of the above three issues.

With respect to the risk of associated gas production, only Paramount asserts that associated gas production does not place SAGD recovery at risk.

On this basis Paramount requested that the Board change the production status of 203 of its wells from shut-in to produce. However, for the reasons outlined previously, the SSG contends that both the 3-D geostatistical models and the 2-D flow simulation models on which Paramount relies are seriously flawed. As such, the SSG contends that Paramount's modeling evidence has not dispelled the uncertainty and risk that production of associated gas impacts bitumen recovery. Therefore, the SSG contends that those 203 wells must remain shut in. CNRL stated the following with respect to this issue in this hearing:

> "The position of CNRL is that there are impacts to having gas, basically a gas cap regardless of the pressure will negatively impact SAGD. That's the

> belief of CNRL. As the pressure goes down obviously it becomes more difficult to operate. So there are circumstances where CNRL would believe that the shut in of gas would be appropriate." [Transcript, p. 641]

As a producer of both gas and bitumen, the SSG assumes that CNRL is basing these comments on field experience. In the SSG's view these comments should be accorded significant weight by the Board. The SSG agrees with this position and continues to assert that the production of associated gas carries with it the real possibility of the sterilization of an enormously valuable resource.

Regarding what bitumen should be considered to be potentially recoverable, the SSG contends that the GB 2003-28 definition, including the concept of "accommodation space" for the McMurray, remains the most appropriate benchmark for the assessment of potentially recoverable bitumen in the RGS area.

Adopting a different bitumen pay cutoff for the Wabiskaw B Valley-fill, as advocated by CNRL and ISH, places significant quantities of potentially recoverable bitumen at risk and should therefore be rejected.

Finally, the SSG contends that in some cases uncertainties exist in the interpretation of whether gas is in association with potentially recoverable bitumen. The SSG considers these uncertainties arise in two general categories: First, where there are pooling interpretation disputes, this category includes the Hardy Wabiskaw McMurray A pool as well as the pooling interpretations the SSG's pooling interpretations that are disputed by CNRL, Stylus and ISH.

Second, both the SSG and Nexen demonstrated that significant uncertainty exists with respect to the sealing capability of the Wabiskaw D shale.

10:30

In the face of such uncertainty and risk the Board should err on the side of caution and protect potentially recoverable bitumen by ordering the shut in of that gas.

Sir those conclude the SSG's comments subject to any questions you might have.

THE CHAIR: The Board has no questions, Mr. Mousseau, thank you.

MR. MOUSSEAU: Thank you sir.

THE CHAIR: We will take our morning break

10:31

for 20 minutes.

Is Ms. Kolber in the room. Do you have a rough estimate of how long you need for your argument.

MS. KOLBER: I suspect it will be about an hour.

THE CHAIR: Thank you. We will be back in 20 minutes.

(ADJOURNMENT)

THE CHAIR: Thank you. Please be seated. Mr. Sali.

MR. SALI: Thank you, Mr. Chairman. If I can take just a moment to briefly address a scheduling issue. While we don't have a consensus amongst counsel because I just mentioned it in the course of the break, and it may be academic in any event depending on how long the arguments 10:55 take.

Inasmuch as I have not had an opportunity to dialogue with the Paramount panel in the way that others have because they've been under cross-examination and were not excused until this week, I'm obviously at somewhat of a bit of a disadvantage in the sense of getting caught up to speed on a number of issues.

What I would propose is this, and I expect that the scheduling is going to take us through the balance of the day for arguments other than my own, I would be happy 10:55 and very pleased if the Board would say, Mr. Sali, you can deliver your submission first thing in the morning and if you want to start at 8:30 that's fine by me.

I would also say to you I would not ask for any rebuttal opportunity because by that time I've heard the arguments and I would have a complete argument so that you wouldn't have to hear from me again, and it may be that it's all academic if we take the balance of the day in any event, but I wanted to just plant that seed with you at this stage.

THE CHAIR: I haven't discussed it with my colleagues, Mr. Sali, but the way I have been thinking was that the normal course of things would take us so far along in the day that we'd have to, even if you did start you would have to break up your argument and that's not my favorite thing, so I don't know if other counsel wanted to speak to

10:56

this.

We're quite happy to have you proceed tomorrow even if we're finished maybe a little earlier in the day than might be the case.

MR. SALI: Thank you, Mr. Chairman.

THE CHAIR: Mr. Mousseau.

MR. MOUSSEAU: I hesitate to rise, Mr. Chairman, but I do note that that would provide Mr. Sali with an opportunity of working on both his argument and his rebuttal overnight.

10:57

I think if there's sufficient time, I know the SSG is prepared to sit late today if that's a possibility to get that done and put everyone on an even playing field for rebuttal tomorrow.

THE CHAIR: I think no matter what we do, Mr. Mousseau, some party or another is going to be advantaged or disadvantaged to some extent. We're influenced by the fact that Mr. Sali has not been able to sit with his witnesses until this week and I think we have to accept that.

MR. MOUSSEAU: Thank you.

THE CHAIR: Thank you, sir.

MS. KOLBER: Thank you.

THE CHAIR: Mr. Rowbotham.

MR. ROWBOTHAM: Just as a point of clarification, sir, in the order of argument, Stylus follows
10:58 after Paramount. I wanted to make it clear that if the rest of the argument should be completed before the end of the day, it would be my preference to stay in that order, our argument is going to be relatively short but due to a scheduling problem late this afternoon I really would prefer to present my argument in the order in which it's shown.

THE CHAIR: That should be fine, sir.

MR. ROWBOTHAM: Thank you.

THE CHAIR: Ms. Kolber.

MS. KOLBER: Mr. Chairman, Alberta has a world-class bitumen resource. There is an estimated 1.6 trillion barrels of bitumen in place, of which the EUB recognizes an ultimate potential recoverable resource of 315 billion barrels based on current technology. [EUB ST 2004-98 "Alberta's Reserves 2003 and Supply/Demand Outlook

2004-2013", page 2]. A significant portion of this resource is at risk from depletion of overlying associated gas pressure. The principal issue in this hearing is conservation of the bitumen resource in light of this risk.

As this panel is aware, the hearings addressing this conservation issue have extended over nine years. Throughout this period, the knowledge of the Board and industry has and continues to significantly increase. In this hearing, Petro-Canada has provided new pressure and geological information to add to this knowledge base. As the knowledge base expands, so too does our understanding of the means, nature and adverse impact of communication between bitumen and associated gas.

New pressure and geological evidence presented as a part of this hearing confirms that the A2 and B2 mudstones and the Wabiskaw D shale are not seals. Accordingly, increased volumes of bitumen are at risk due to depressurization of associated gas pools. The conservation issue is clear and the evidence at this hearing supports the Board's prior decisions. If the gas is produced before the bitumen, we lose the bitumen. If the bitumen is produced first, both resources are recoverable.

The conservation concerns at Chard are also exacerbated by the advanced pressure depletion of the Wabiskaw McMurray gas pools, a fact that the Board recognized in GB 2003-28. There is no margin for error. The current low pressures require immediate action to ensure bitumen conservation.

Continuing gas production in the face of demonstrated pressure communication is, as the Board has stated, "...an unacceptable risk." [GB 2003-28, page 2]. The associated gas wells and pools must be shut-in.

Mr. Chairman, consistent with the issues list for Phase 3, this final argument will focus on Issue No. 3, lateral continuity of mudstones and shales, and Issue No. 4, the effect of gas production on SAGD recovery as determined by reservoir models. We will also briefly comment on the remaining technical and policy issues identified by the Board.

With respect to Paramount's suggestion throughout this hearing that Petro-Canada should be restricted to addressing its own interests in the Chard area, it must again be emphasized that Petro-Canada acts on behalf of the PCEJ owners, including JACOS, Imperial and Nexen, all of which have interests outside of the Chard area.

Mr. Chairman, the PCEJ Owners have two requests of the Board.

First, that the Board shut in the gas pools from which the nine PCEJ application wells produce.

And second, that the Board order a pressure monitoring program to collect pressure data to identify the nature of communication between bitumen and associated gas throughout the Chard area.

Mr. Chairman, before proceeding to discuss the issue of lateral continuity of the mudstones and shales, I would like to briefly deal with the issue of potentially recoverable bitumen.

Petro-Canada's evidence to this hearing contains a net pay map of the Chard resource [Petro-Canada Reply Submission, page 6], which shows the nine wells that Petro-Canada references as being contiguous with significant bitumen accumulations. These are the same accumulations that the Board refers to in the Chard Leismer decision [page 11], where it states:

> "The Board shares Nexen's and the SSG's view that the bitumen resources in the Chard Leismer area are on trend with Alberta's most significant deposits."

In that hearing, the Board also determined that:

> "The bitumen-in-place estimates and mapping provided indicate the existence of a significant amount of potentially recoverable bitumen in the Chard Leismer area, which warrants consideration for protection for future

development." [Decision 2003-23, page 11].

Petro-Canada submits that there has been no evidence presented at this proceeding to cause the Board to reverse this finding.

The Board has identified the lateral continuity of mudstones and shales as a significant issue in this hearing. I will now speak to the pressure and geological evidence that confirms that the A2 and B2 mudstones and the Wabiskaw D shale are not effective seals.

The pressure record gathered since the Chard Leismer hearing provides compelling evidence of widespread communication, over engineering time, through the complex McMurray geological framework. The influence of depleted gas pool pressures is extensive and occurs both vertically to underlying bitumen and laterally through the regional aquifer to the bitumen.

Two types of pressure data are currently available. First, there is continuous time series piezometer observation well data; and, second, there is conventional wellhead, static gradient and buildup data.

The inconsistency and sparseness of the conventional pressure record assembled by the gas producers makes it problematic to define communication issues because the pressure survey programs were not designed for this purpose. Nevertheless, there are some meaningful conclusions that can be drawn from this conventional data record and from piezometer data trends.

Petro-Canada's evidence addressed five examples of piezometer-equipped observation wells which confirm vertical continuity pathways between the top gas and underlying bitumen. The 102/9-24-80-7W4 well has five years of continuous time series piezometer data. This data confirms pressure communication from depleted top gas through the bitumen column to bottom water.

In addition, the Corner C Pool 02/3-34-80-10W4 well and the offsetting 5-14-80-10W4 well show similar progressive depletion through underlying bitumen saturated IHS to the main bitumen zone. [Petro-Canada Response Submission, pages 13 and 16].

The validity of the piezometer record was questioned in the Chard Leismer hearing where it was suggested that the pressure depletion trends might be gauge-related artifacts. The new and more extensive data confirms that the depletion is in fact a reservoir-induced response.

Over the past three years, a consistent pattern has emerged that establishes continuity between top gas and bitumen. [Petro-Canada February 14, 2005 Submission, page 47, Figure 5.9].

Paramount itself concludes that pressure in the bitumen column has decreased concurrently with gas zone depletion in the 02/3-34 well (Page 52, Corner C Pool Report), thereby recognizing that the declining pressure trends are in fact valid.

Mr. Chairman, it is accepted that breaches occur across the A2 and B2 mudstones. This is confirmed by pressure evidence. The 10-14-79-7W4 well data set demonstrates communication across the RGS regionally mapped A2 and B2 mudstones. CNRL attempts to rationalize the 10-14 response as being caused by wellbore communication. This hypothesis is not supported by the initial four months of pressure data that shows diverging pressure trends. [Petro-Canada Reply Submission, page 25, and Figure 9, page 26].

The 10-26-81-7W4 case study is an example of pressure communication laterally through an aquifer and vertically around one of the thickest McMurray mudstones. Pressure depletion from adjacent gas sands occurs around a 21 metre shale plug through 25 metres of underlying bitumen to bottom water. [Petro-Canada February 14, 2005 Submission, page 36]. It is notable that this depletion trend reverses at the time of the shut-in of overlying gas production, demonstrating direct pathways between gas and underlying bitumen in the McMurray.

The new 10-26 pressure data has addressed the Board's concerns regarding the integrity of the pressure data presented at the Chard Leismer hearing. [Petro-Canada February 14, 2005 Submission, pages 37-39].

With regard to the conventional pressure record, Petro-Canada presented the data for the 11-33-79-7W4 and 12-35-79-7W4 wells. This example identifies pressure communication across the A2 mudstone between the A and B sequence gas sands. This communication is likely caused by significant regional faulting in the area as a result of underlying salt dissolution. [Petro-Canada Reply Submission, page 9].

An alternative interpretation suggests that pressure depletion at the 11-33 well is due to communication through the regional aquifer from offsetting depleted gas pools. This interpretation is inconsistent with the initial pressure records across the wells.

The more compelling explanation of the pressure responses in the 11-33 and 12-35 wells is the equilibration of the two sands through communication resulting from faulting through the A2 mudstone.

The undisturbed regional dip of the Wabiskaw in the vicinity of these wells is 1.5 to 2 metres per kilometer [TR 348 ln 9-13]. However, the 12-35 well has a 12-metre structural displacement from the 6-2 well, only 1.25

kilometers away [TR 349 ln 19-24]. This notable difference within a limited distance is evidence of localized faulting.

This position is further supported by Dr. Wardlaw's observations in the "Review of the EUB Regional Geological Study" [Appendix A, the RGS, p. 167], where he states:

> "Faulting and jointing associated with salt-solution collapse and with Laramide tectonics, after deposition of McMurray-Wabiskaw sediments and emplacement of bitumen, is highly probable. The extent of such faulting is unknown but has the potential to breach thin mudstones that are considered as barriers to pressure communication. There is the added risk that faults in bitumen could contribute to accelerated steam breakthrough from a SAGD chamber to an overlying water or gas zone."

Since mudstones can be breached through faulting, the 11-33 and 12-35 case study provides evidence of pressure communication caused by faulting that occurs across regionally mapable mudstones.

In summary, when analyzing the pressure

evidence in relation to the lateral continuity of the mudstones and shales, the Board should consider that the new pressure data collected over the past three years has provided additional evidence of both lateral and vertical communication between gas and bitumen; that the additional piezometer data has resolved concerns regarding gauge artifacts; and that the combination of piezometer and conventional data supports Petro-Canada's geological interpretation.

This now brings me to the geological evidence that explains why the A2 and B2 mudstones and the Wabiskaw D shale are not effective seals.

Seal Geometry and Seal Integrity are two important criteria which explain the existence of communication pathways and the lack of seal reliability in the Chard area.

Seal geometry of the A2 and B2 mudstones, that is, where they exist and where they do not, is compromised by the stratigraphic framework of the McMurray.

In particular, the lateral extent of these thin deltaic bayfill mudstones is cut by incised valley, channel fill and tributary deposits.

Paramount's geologic witness, Dr. Ranger, acknowledges that, although the A2 and B2 mudstones are mapable, they are also breached in many areas and have a limited continuity of up to 1,000 metres [TR 848, ln 11-21].

While the stratigraphic framework, which includes the mudstone erosional edges and McMurray channel sands, leads to multiple interpretations the inescapable conclusion is that this complex, diachronous geology provides lateral and vertical communication pathways.

In addition to Seal Geometry, Seal Integrity of the A2 and B2 mudstones, that is, whether the seal is breached, is compromised by vertical structural displacement resulting from salt dissolution collapse of Devonian evaporites.

The evidence shows that abrupt displacements are common throughout Chard and drastically exceed the undisturbed regional dip and the mudstone thicknesses [Petro-Canada response to IR No. 2 of Board Staff]. This has been confirmed by both CNRL (page 21, Reply Submission) and the RGS (page 167).

In the Chard area, Seal Integrity of the mudstones is compromised in the vicinity of five of the nine application gas wells.

The 10-23-80-7W4 gas well is adjacent to salt collapse in the AA/10-26-80-7W4 well [Figure 3, Exhibit K-12].

The 10-11-80-7W4 gas well is adjacent to salt collapse in the 6-2-80-7W4 well [Figure 3, Exhibit K-12], and is only 1.25 kilometres from the 12-35-79-7W4 well which has a 12-metre structural displacement.

The 12-35 well also has evidence of pressure communication across the A2 mudstone [TR 349 ln 19-24].

The 4-35-80-7W4 gas well is adjacent to salt solution collapse in the AA/10-26-80-7W4 well [Figure 4, Exhibit K-12].

And finally, the 3-34-80-7W4 and 14-3-81-7W4 gas wells are adjacent to salt solution collapse in the 6-4-81-7W4 well [Figure 5, Exhibit K-12].

The vertical displacements at these locations range from 9.6 to 14.5 metres over an inter-well distance of only 1.3 to 2.5 kilometers, and are of a sufficient magnitude to displace, fracture, and breach the Seal Integrity of the thin one-metre mudstones in the Chard area. The result is the creation of communication pathways.

Mr. Chairman, there are similar concerns regarding Seal Geometry and Integrity of the Wabiskaw D shale. The Wabiskaw D shale is not a competent seal because its framework consists of discontinuous and distinctly different erosional remnants of three separate units preserved at the same stratigraphic level [TR 23 ln 9-14].

In addition, where the Wabiskaw D shale is present, its Seal Integrity is also compromised by a thin, brittle and fissile lithology that can fracture from even minor structural disturbances [TR 24, ln 20 to TR 25, ln 8 and TR 27, ln 1-16].

Pressure analysis in the Chard area confirms that even where the Wabiskaw D shale appears to be consistently thick, it is not a regional barrier [TR 28, ln 18 to TR 29, ln 6; SSG Feb 14 Submission, page 16].

Seal Integrity is breached by fractures, which explains pressure communication across the Wabiskaw D shale in the Chard area [TR 29, ln 7-18]. This results in Case 3 communication between A Sequence gas and McMurray channel bitumen.

When the Wabiskaw D shale is absent, a Case 3 communication pathway occurs between the A2 sequence, the A1 sequence, through the Wabiskaw C sand, to potentially recoverable bitumen in the McMurray channel sands [RGS Case 3 Schematic #2, Figure 99].

The same Case 3 communication pathway occurs even in the presence of a Wabiskaw D shale because it is not a seal [TR 33, ln 1 to TR 34, ln 2].

In the Chard area, Case 3 pressure communication in this manner across the Wabiskaw D shale is of particular concern in McMurray A Sequence gas wells below the Wabiskaw U/D-37 pool.

Given that the Wabiskaw D shale is not a seal, the Wabiskaw C gas in the Wabiskaw U/D-37 pool needs to be shut-in [Appendix 1, SSG February 14, 2005 Submission]. Wells in the Wabiskaw U/D-37 pool include: 7-13-80-7W4, 7-14-80-7W4, 10-23-80-7W4, and 02/9-24-80-7W4.

Wabiskaw C gas overlies McMurray A sequence gas in the 10-23 and 7-14 wells, and overlies McMurray Channel gas in the 7-13 and 9-24 wells [Figure 3, Petro-Canada Reply Submission to the Second Interim Hearing; Figure 8, Exhibit K-12; Log 1, Petro-Canada Reply Submission].

The compromised Seal Integrity of the Wabiskaw D shale renders it incapable of preventing pressure communication between Wabiskaw C gas and McMurray channel gas in the 7-13 and 9-24 wells.

Similarly, Wabiskaw C gas is in communication with McMurray A Sequence gas in the 10-23 and 7-14 wells across the Wabiskaw D shale. A Sequence gas in the 10-23 and 7-14 wells in the Chard McMurray VV pool, as designated in Decision 2004-6,) is similarly associated with over 35 metres of potentially recoverable bitumen in both the 7-13 and 9-24 wells.

The A sequence gas in the 10-11-80-7W4 well is in the Chard McMurray VV pool. The McMurray A sequence VV pool is in vertical communication with the Wabiskaw C U/D-37 pool through the Wabiskaw D shale.

The Wabiskaw C U/D-37 pool is in communication with the potentially recoverable bitumen in the 9-24 and 7-13 wells. This is Case 3 communication in the absence of an effective Wabiskaw D seal, and requires the shut-in of the Chard McMurray VV pool.

I would now like to briefly discuss the implications of conducting a core study of the A2 and B2 mudstones.

Unlike the Wabiskaw D shale, an extensive core study of these mudstones has not been conducted [TR 30, ln 13-16].

As a result of the SSG's detailed Wabiskaw D core study, the SSG has now concluded that the Wabiskaw D shale is not a regional barrier [TR 31, ln 3-11].

The SSG has acknowledged that a similar rigorous core study of the A2 and B2 mudstones would be helpful [TR 30, ln 17-22]. A similar study may show that the A2 and B2 mudstones are compromised.

This is particularly germane given that Paramount has acknowledged that the A2 and B2 mudstones are breached in many areas [TR 848, ln 16-18].

In light of the SSG's revised interpretation regarding the Wabiskaw D shale, the Board cannot rely on the A2 and B2 mudstones to act as seals, unless these seals are determined to be competent by pressure data and a similar rigorous core study.

Mr. Chairman, the geologic evidence supports the pressure data and substantiates Petro-Canada's conclusions that extended lateral continuity of the Wabiskaw D shale and the A2 and B2 mudstones does not exist. These units are not seals. The mudstone analogy to a raggedy blanket remains relevant [TR 354, ln 11-23].

I would now like to discuss the effect of Associated Gas Production on SAGD Bitumen Recovery Based on Paramount's modeling.

To put Paramount's modeling work in context, I would like to read a quotation from Mark Twain:

> "In the space of 176 years, the Lower Mississippi has shortened itself 242 miles. That is an average of a trifle over a mile and a third per year. Therefore, any calm person...can see that in the Old Oolitic Silurian Period, just a million years ago next November, the Lower Mississippi was upwards of 1 million three hundred thousand miles long, and stuck out over the Gulf of Mexico like a fishing pole. And by the same token, any person can see that 742 years from now, the Lower Mississippi will be only a mile and

> three quarters long, and Cairo (Illinois) and New Orleans will have joined their streets together and be plodding comfortably along under a single mayor and a mutual board of aldermen. There is something fascinating about science. One gets such wholesale returns of conjecture out of such a trifling investment of fact."

When one reviews Paramount's modeling, it is essential to separate conjecture from fact. The purpose of geostatistical modeling is to accurately represent the reservoir.

The purpose of simulation modeling is to accurately represent reservoir performance. These can be valuable tools, but Paramount itself acknowledges that, if the steps are done incorrectly, the model results may be compromised [TR 1334, ln 7-12].

Paramount has not accurately represented the reservoir, nor has it correctly simulated reservoir performance. The modeling results are therefore not valid.

I would like to discuss Paramount's modeling in the sequence of the workflow process.

Paramount stated that it applied discriminant analysis to all the cored wells and "used the core descriptions as the basic control and the basic input." [TR 951, ln 25 to TR 952, ln 3].

Paramount further stated that it calibrated the discriminant function analysis to the "real data which is the core data." [TR 953, ln 24 to TR 954, ln 5]. This is not the case.

Paramount's Corner McMurray C Pool evidence includes facies profiles and lithological columns calculated from discriminant analysis for the 3-3 and the 02/3-34 wells. However, Paramount did not use core descriptions from these wells as the basic control and basic input. [TR 1449, ln 24 to TR 1450, ln 11]. Nor did Paramount provide core logging plots for the 3-3 or the 00/3-34 wells. [TR 1446, ln 13-19].

As a result, the accuracy of the discriminant analysis on the 02/3-34 well cannot be tested. This is important because in Paramount's simulation of the Corner McMurray C Pool, the well used to forecast SAGD production response to overlying gas pool depletion was the 02/3-34 well, a well that did not honour the core description. [TR 1371, ln 25 to TR 1372, ln 8].

Paramount suggests that it used core control to build its discriminant analysis on wells without core. [TR 1361, ln 3-16]. It did not do so. For example, at the 00/3-34 well, although core is available, logs are not. At the 02/3-34 well, which is a mere 15.4 metres away, logs are available but core is not. [TR 1507, ln 25 to TR 1508, ln 3].

To be consistent with its stated approach, Paramount should have used the core from the 00/3-34 well to build its discriminant analysis for the 02/3-34 well.

Under cross-examination and after some confusion on Paramount's part, it is clear that Paramount did not honour the available core data. [TR 1402, ln 14-25, TR 1507, ln 25 to TR 1508, ln 7].

In the case of the twinned 3-34 wells, the calibration of the discriminant analysis facies profile to core control was not done. [TR 1448, ln 21 to TR 1449, ln 2]. These inconsistencies raise serious questions regarding the reliability of Paramount's McMurray Corner C SAGD simulation model, as the 3-34 well was used as the basis for this model.

The treatment of mud breccia represents another inconsistency in Paramount's methodology. It is important to note that mud breccia is considered a reservoir unit. Paramount specifically used a core photo of breccia from the 3-34 well to define breccia as a facies type in its facies scheme. [Paramount February 14 Submission, Corner McMurray C Pool, page 25]. However, Paramount's discriminant analysis failed to identify the breccia that exists in the 3-34 well, thereby eliminating a significant bitumen reservoir facies. [TR 1443, ln 22 to TR 1444, ln 2, and TR 1444, ln 12-14].

Similar inconsistencies likely occur in Paramount's other modeling studies.

The geostatistical modeling and validation raises additional concerns. Paramount has stressed the amount of effort expended to create and validate its four geostatistical models. However, Mr. Chairman, there is insufficient well density, only one to one and a half wells per section, to provide adequate well control for meaningful site-specific geostatistical modeling. As a result, Paramount's models are flawed and unreliable. By way of example, one need only look at the facies properties that Paramount has assigned, the porosity-permeability transform it used, and its attempted history match.

I will first speak to the facies properties.

Paramount claims that the facies descriptions are independent of petrophysics. However, the petrophysical properties in its models must agree with generally understood properties of the facies. For example, Dr. Ranger discussed the bioturbated nature of marine sand [TR 1018, ln 3-11] and stated that marine sand is muddier than clean sand and in fact can be much closer in overall sand content to interbedded mud. To provide a valid result, these characteristics should hold true in the geostatistical modeling but they do not.

Table 4 of the Corner McMurray C Pool report [page 34] shows that the volume shale content of marine sand in the A1 zone is 2 percent, while the Vshale content of interbedded mud in the same zone is 28 percent. In Table 5 of the same report, the marine sand in the lower McMurray has a Vshale content of 0.2 percent, while the interbedded mud has a Vshale content of 22 percent. Similar observations can be made in all of Paramount's geostatistical models for Vshale and other properties.

As a result, marine sand and interbedded mud in Paramount's models do not honour Dr. Ranger's generally accepted properties.

Interbedded mud is treated in a similarly inconsistent manner. According to Paramount's facies scheme, an interbedded mud is defined as being comprised of 10 to 70 percent sand; however, in all of Paramount's geostatistical models, the average Vshale is universally less than 30 percent. Conversely, sand is defined as containing less that 10 percent mud, yet in the X pool geostatistical model the sand has an average Vshale of 11 percent.

Another example of an inconsistency is in the Hangingstone McMurray KKK pool geostatistical model where the average Vshale content for interbedded sand is less than that for clean sand. [Appendix 8, Table 2].

When questioned why the mud plug facies, defined as greater than 90 percent mud would have a mean Vshale of only 41.1 percent, Paramount responded, "Again, sir, they are what they are. This is as accurate as we can make them, yes." [TR 1023, ln 8]. Indeed, they are what they are and what they are is inaccurate.

Paramount's geostatistical model facies properties are inconsistent with their own facies definitions and with statements made by members of the Paramount panel. As a result of these inconsistencies, Paramount's geostatistical models are unreliable.

Paramount's treatment of the porosity-permeability transform in its geostatistical model is also of concern. Paramount developed this transform using a limited set of core data. [Exhibit I-38]. Paramount assumed that all the data used to generate this transform was obtained at horizontal overburden conditions. Through cross-examination, it became clear that the data set consisted of both horizontal and vertical overburden data and likely included horizontal ambient data as well. A transform that combines these different data types is not valid.

Furthermore, Paramount's use of the derived porosity-permeability transform is inappropriate. Although it was core-derived, this transform was applied to effective porosity in Paramount's geostatistical models.

Paramount suggests that this is a valid approach because, in its view, the core data overstates in situ porosity and permeability. [TR 1041, ln 3-11]. However, Paramount has not presented any work that quantifies the magnitude of its identified permeability reduction.

Paramount agreed that, generally, log-derived porosity is 2 to 4 percentage points lower than core-derived porosity. [TR 1039, ln 18-21]. While Mr. Crain indicated that in a clean sand the difference would not be as high as 4 percentage points. [TR 1375-6, ln 24]. In a very shaley interval, the difference could be much higher. [TR 1374, ln 19].

He did state, "And the 2 to 4 percent I agreed with on the basis that the zone was fairly clean, as I've just described, and that the clay-bound water was not a big issue." [TR 1375, ln 21].

As a result, clean sand in Paramount's geostatistical models is not subject to the potential 4 percentage points difference between log and core porosity. The remainder of the facies, essentially non-sand facies, can be classified as fairly clean to very shaley and are therefore subject to the potential 4 percentage point or greater difference.

According to the facies property tables in Paramount's submissions, the non-clean sand facies in the 4 pool study ranges from 60 to 80 percent in the Lower McMurray zone and is 100 percent in the A1 zone. In all, more than 75 percent of the rock volume modeled by Paramount is subject to a potential difference of 4 percentage points between log and core porosity.

Paramount's porosity-permeability transform illustrates a more than five-fold reduction in permeability whenever the effective porosity is 4 percentage points less than the total porosity. In order for this to be valid, the overburden permeability measurements have to be more than five times greater than the true in situ permeability. This is simply not plausible.

Paramount's evidence and admissions point to the conclusion that more than 75 percent of the rock volume contained within Paramount's geostatistical models is in facies where the modeled permeability can be more than five times too low. When carried forward to SAGD simulation, these unrealistic permeabilities invalidate the SAGD model results.

Paramount's 3-D history match approach is also flawed. It was Paramount's stated intent that the geostatistical models would be validated through 3-D history matches. [TR 790, TR 1075, ln 2]. Paramount's attempts to validate its models through history matching are unsuccessful for two reasons: First, it did not achieve a match; and, second, it did not match relevant empirical data.

One of the reasons Paramount did not achieve a match is due to the poor quality of much of the available data. Paramount, itself, agrees that much of the data is of questionable value and, in recognition of this, stated that it elected to use the 2004 static pressure measurements as the best available data to gauge the overall conformance of the model. [TR 872, ln 19]. Yet, with regard to the C pool model, Paramount concedes that it did not attempt to match these 2004 static pressure measurements. [TR 1467, ln 16-17 and TR 1468, ln 23-24].

In fact, most of the wells that Paramount attempts to history match for the C pool contain only one initial pressure. One data point is clearly insufficient. A history match implies that there is some history.

History matching of the gas pool pressure data set was not conducted. Paramount states: "The uniform change to gas pore volume was done to match the decline curve or the production performance." [TR 1390 ln 5]. This means that the water saturation reduction in the A1 interbedded sands and mudstones to a value of 19 percent, appropriate for a clean sand, is a simple adjustment to match overall decline gas volumes. It does not establish an adequate pressure history match in the model.

Figure 26 in Paramount's response to

Petro-Canada's information request presents Paramount's attempt at a history match for the Hangingstone X pool. None of the pressure data shown on this figure have been matched. Of particular note, although Paramount simulated the post shut-in build-up in 2004, the pressures in the simulation model have stabilized at 300 kpa below the actual field pressures. Paramount's history matching attempt for the Hangingstone X pool is as unsuccessful as that for the Corner C pool.

In the end, Paramount has not achieved a history match for either pool, either due to a lack of data, a failure to match recent data, or both.

In respect of the Corner G pool, it is impossible to determine whether Paramount obtained a history match given that the figure in this report showing simulation pressure results [Figure 28] does not contain any actual pressure data.

Mr. Chairman, even if Paramount had obtained a successful history match, it would be insufficient to validate the geostatistical model because it does not address SAGD performance. By matching only gas pressures, particularly using averaged rates, Paramount would have only achieved a gas material balance history match.

While gas pool performance is largely a volume issue, SAGD performance is much more complex. Without historical SAGD data to match, it is impossible to verify that the SAGD volumes are correct. More importantly, it is impossible to verify that the permeability values and reservoir architecture are correct. Paramount does not history match any SAGD performance [TR 1077, ln 10]. Therefore, contrary to Paramount's assertions, the geostatistical model has not been validated.

Paramount has overlooked these problems. Mr. Norris stated that "In this case, we had few global changes in order to achieve a satisfactory match, and that's very important." [TR 791, ln 3].

This is analogous to saying whenever we shot an arrow we hit a target. The problem is that Paramount did not hit the right target or even a consistent target.

The real reason that few global changes were required is because, in the absence of sufficient pressure data and because it did not match the data that did exist, Paramount had not achieved a history match.

Further on, Mr. Norris stated "So at that point, we've essentially validated the geology; we feel this is now satisfactory to use for flow simulation sensitivity studies" [TR 791, ln 17].

And later, Mr. Engelman stated "Given the stated objectives and the intended application, sparse and uncertain pressure record, Paramount concluded that the field match was acceptable and adequate for purpose." [TR 874, ln 10].

The evidence shows that Paramount's field match is neither acceptable nor adequate. Paramount ignores, or is unaware, that it has not achieved a history match. Paramount equally ignores, or is unaware, that even if a successful history match had been obtained, that history match would not validate the geostatistical modeling because it only represents the gas zones and not the entire reservoir volume that is modeled.

The Board cannot ignore these deficiencies in Paramount's modeling.

Mr. Chairman, another area of concern relates to the simulation modeling. In particular, Petro-Canada has identified six areas of concern: First, there are volumetric flaws in the 3D full field models; second, there are concerns relating to the geological homogenization in the 2D SAGD simulation; third, questions arise relating to the inappropriate well placement in the 2D SAGD simulation; fourth, the 2D SAGD model shows interaction between the gas and the steam; fifth, the simulation modeling results preclude the development of a clearly commercial resource at the Corner C pool; and sixth, there are a plethora of errors in the generic 3D SAGD models.

I will briefly discuss each of these

simulation modeling concerns.

First, regarding the volumetric flaws within the 3D full field models, Paramount, in its Corner C pool submission, claims that there was an "excellent match" between the A1 zone gas volumes in the geostatistical model and the A1 zone gas volumes from decline analysis [Corner C Pool Report, page 15].

In tuning the simulation model, Paramount conceded that the A1 gas zone volumes were 69 percent above Paramount's decline analysis volume and the channel gas volumes were 13 percent below the decline analysis figure [TR 1388, ln 5-19]. Paramount has acknowledged this discrepancy [TR 1389, ln 1-3].

The fact that these numbers do not match is highly problematic. Paramount does not have a consistent gas volume match of the A1 and McMurray zone gas volumes between its geological model, decline analysis and simulation model in the C pool.

To force congruence between simulation volumes and the production decline analysis volumes, Paramount arbitrarily reduced the water saturation in the gas zones to unrealistic levels [TR 1390, ln 5].

In reality, Paramount does not have any match, let alone an excellent match. The second concern with Paramount's simulation models arises from the limitations in incorporating 3D geology into a 2D model.

Paramount stated that its approach used "geostatistical methodology designed to preserve the full variability of the data and is consistent with industry practice and in Paramount's view the most appropriate methodology for predicting flow performance" [TR 783, ln 22].

Paramount made repeated references to the detail contained in its models using phrases such as "realistic geological heterogeneity" [TR 785, ln 1] and "realistic geological description" [TR 786, ln 7].

However, in constructing its 2D SAGD simulation models from its 3D geostatistical models, Paramount removed most of the detail it claims is so important.

With reference to the third dimension, Paramount stated, "the Y is an artifact of the 2-D model, it does not reflect, in our view, a realistic geology. But that is the nature of a 2-D model, it's not a 3-D model" [TR 1064, ln 19].

By Paramount's own admission, the 2D models cannot capture the realistic 3D geology that it has attempted to incorporate into the geostatistical models. During a discussion of the influence of baffles in its 2D SAGD models, Paramount underscored the inability of the 2D models to reflect the actual geology when it stated: "What we attempted to do was build realistic geology and in the McMurray formation realistically there is heterogeneity. In fact, there is so much heterogeneity that we can't seem to predict what's going to happen outside of a wellbore" [TR 1418, ln 3].

Paramount recognizes that the scale of McMurray heterogeneity precludes an accurate description beyond immediate well control.

Paramount's placement of wells in the 2D SAGD simulation models is questionable and raises a third concern regarding the validity of the simulation work.

In the Hangingstone X Pool 2D SAGD model, all three producer wells are located in cells that have less than 35 millidarcies of vertical permeability. When this very low absolute vertical permeability is combined with relative permeability effects and viscosities greater than 5 centipoise, the results will be extremely poor. In fact, after 7 years of modeled steam injection, the steam chamber development is severely limited [Figure 40, page 59, Hangingstone X Pool Study].

A reasonable operator would never place commercial wells in such low permeability reservoir. This emphasizes Paramount's fundamental lack of understanding regarding the physics of modeling realistic SAGD performance.

As Paramount's witness confirmed, "We're not bitumen producers, of course, so I can't really comment on what a bitumen producer may or may not do" [TR 1052, ln 13-14].

The fourth concern regarding Paramount's simulation models is that they prove the opposite of what Paramount intends them to prove.

Paramount contends that depletion of overlying gas pressure will not impact bitumen production. However, its model shows that there will in fact be a negative impact on bitumen production.

Paramount's 2D SAGD modeling demonstrates interaction between the steam chamber and the overlying gas.

I'd like to reference the Corner C Pool report, where Paramount states [page 62]:

> "Temperature distributions shown on Figure 44 also indicate the second and third SAGD well pairs eventually break through to the overlying gas strata. Reservoir quality immediately above these wells is very good and the steam chamber growth is not impeded. Once the steam chamber directly encounters the gas a sudden drop in bitumen production rate occurs. Although the SAGD process recovers the performance

> subsequent to the breach is an artefact [sic] of the 2D model configuration."

Paramount's 2D SAGD model for the C pool shows that, in the vicinity of the 3-34 well, bitumen production is adversely affected when the steam chamber hits the gas zone (that is, the "sudden drop"). This is not an artifact, as Paramount contends, but is the real consequence of steam chamber interaction with the depleted gas zone.

The artifact is actually the recovery of the bitumen production rate due to re-pressuring the unreasonably small gas cap volume in the simulation model.

What is important here is that the C pool 2D SAGD model actually confirms that low pressure top gas has a negative impact on SAGD performance. When faced with the obvious conclusion that there was a negative impact on SAGD performance and when questioned why it terminated the model runs immediately after the steam chamber encountered the gas zone, Paramount stated [TR 1441-2]:

> "The runs were terminated because the 2-D formulation and the operating system that we had chosen are incompatible. To handle that situation, we proposed that the 3-D pressure maintenance scheme be adopted as appropriate."

Having undertaken the 2D SAGD modeling, Paramount dismissed the obvious result that low pressure top gas negatively impacts SAGD performance and abandoned the 2D models as inappropriate for evaluating the interaction between the steam chamber and the overlying gas.

If one accepts Paramount's premise that the 2D SAGD models are inappropriate, then its conclusions can only be supported on the basis of the 3D generic SAGD models, which, as we will see, are also, themselves, fundamentally flawed.

Fifth, the negative impact of pressure depletion in the Corner McMurray C pool 2D model is obvious. Paramount acknowledged that, immediately offsetting the 02/3-34 well, it had identified six adjacent wells with a continuous bitumen-saturated clean sand interval of greater than 10 meters [TR 1434, ln 14].

Paramount agreed that these six wells cover an area with approximately 19 million cubic meters of recoverable bitumen, significantly more than the GIAG cutoff of 12 million cubic meters for a commercial SAGD project [TR 1439, ln 8].

During cross-examination, Paramount did not dispute the fact that there could be a commercial SAGD project at the Corner C pool, but stated that there were challenges, including, of note, "the management of the steam chamber development in the presence of a connected gas zone" [TR 1433, ln 7-14].

Taken as a whole, Paramount's evidence confirms that the commercial bitumen at the Corner C pool is at risk due to communication with depleted overlying top gas.

The final concern relating to Paramount's simulation work arises from the fact that Paramount relied upon flawed 3D generic SAGD models to support its conclusions.

Paramount conceded the existence of several physical errors and discrepancies in its initial modeling runs [TR 1480-1493]. Although Paramount attempted to correct many of these errors between the first and second model runs, the results did not change.

When the use of incorrect physics does not impact the modeling results, this raises serious questions concerning the accuracy and reliability of these models.

The failure of the first two iterations was largely a result of a specific round-off error when the injectivity index was set at 10,000. When the injectivity index was properly calculated on the third iteration, the results were significantly different.

In Undertaking 1571, Paramount reran the 3D SAGD models correctly, allowing Exotherm to calculate the injectivity and productivity indices. The results of these runs showed that bitumen recovery was adversely impacted by reduced gas pressure.

In fact, Paramount's summary tables from its response to Undertaking 1571 show that, at a cumulative steam/oil ratio of 3, Paramount's model with the higher overlying gas pressure has produced 4.5 times as much bitumen as Paramount's lower pressure model [TR 1874, ln 25 to TR 1875, ln 7].

According to these models, if the overlying gas pressure is not reduced, bitumen recovery will be greater.

The impact of these effects has been tabulated for comparison in Board Staff's Exhibit A-3. It is clear that, contrary to Paramount's initial claims, overlying gas pressure does impact SAGD performance and bitumen recovery.

In addition to the specific modeling deficiencies I have just discussed, there are many other contradictions in Paramount's evidence. I will briefly outline just a few of those.

First, Paramount stated that it used geological descriptions that were based on multi-well pool analysis. [TR 783, ln 12]. Paramount has modeled the KKK pool which is a single well pool. Clearly, one cannot conduct a multi-well pool analysis on a single well pool.

Second, Mr. Engelman stated that the point to point detailed representation of each available pressure was both impractical and beyond scope. [TR 867, ln 21]. While discussing the same issue, Mr. Norris argued that had we had more data we would have been happy to incorporate how we thought it was a reasonable and appropriate data. [TR 1471, ln 6]. One member of Paramount's panel has stated that more data would be useful, while another member acknowledges that Paramount did not fully utilize the existing data.

Third, with reference to Dr. Ali's 3-D SAGD models, Mr. Engelman stated: "To do the simulation studies he set the steam injection rate to 70 metres cubed per day, that's a half well rate." [TR 1146, ln 5]. When asked about the injection rates in the same 3-D SAGD models, Dr. Ali stated: "We set down the rate at 200 cubic metres." [TR 1126, ln 6]. That translates into a half well steam injection rate of 100 m3 per day, not 70.

And fourth, Dr. Ali, in reference to the permeability of the fifth layer of the 3-D SAGD models being 583 millidarcies, stated that: "I would say it's definitely not what I had in my model." [TR 1481, ln 12]. However, Mr. Norris later stated: "One of the permeability layers had been coded as 583.3 millidarcies..." [TR 1513, ln 18]. Paramount's own witnesses are unaware or confused regarding the actual input data set that they used.

Mr. Chairman, these contradictions, although perhaps not critical on an individual basis, when looked at in the aggregate, and when coupled with all the other flaws previously discussed, underscore the unreliability of Paramount's modeling work.

To summarize the concerns with Paramount's modeling, it is clear that the models were artificially constructed to demonstrate that overlying gas pressure does not impact SAGD performance. Paramount has in fact achieved something quite different. It has created an unrepresentative geostatistical model using insufficient data. It has ignored portions of the minimal data set that did exist. It has also ignored the fact that a gas volume history match does not validate the bitumen zone characterization, and it has failed to even accomplish a gas volume history match.

Paramount removed most of the geologic detail by using 2-D SAGD models and then acknowledged that these models are inadequate to assess steam/gas interaction. Paramount has created generic models with physically incorrect inputs and shown that it does not matter if the inputs are right or wrong. It has used unreliable operating conditions that generate errors in the results.

In essence, Paramount's modeling is flawed from start to finish and cannot be relied upon by the Board.

Paramount failed to show that SAGD performance is independent of gas pressure. In fact, its most recent evidence confirms that SAGD performance is negatively impacted by reduced gas pool pressures.

Mr. Chairman, I will now briefly discuss the issue of pressure monitoring.

Petro-Canada continues to recommend a pressure monitoring program in the Wabiskaw McMurray formations. While the geological framework describes possible paths for communication, pressure data provides direct evidence of the communication dynamics within the reservoir. Although pressure information is critical to define communication and has shown its utility in these proceedings, both the frequency and quality of historical pressure data are lacking. A more comprehensive pressure record is required. It has been clear that the implementation of a meaningful pressure monitoring program requires the intervention of the Board.

A collaborative effort between the Board and industry, analogous to the process resulting in ID 99-1, is an appropriate means to establish a pressure monitoring program within the Chard area. Petro-Canada and the SSG have recommended similar pressure monitoring programs. Each program specifies annual conventional pressure surveys in all gas wells, whether shut-in or producing.

Within the Chard area, Petro-Canada further requests that a permanent downhole gauge be installed in one well in each defined pool to collect a continuous time series pressure data set.

While CNRL generally supported pressure monitoring, it expressed concern regarding the costs of such a program. Petro-Canada adduced evidence that the costs of drilling an observation well in the Chard area, including the installation of multiple piezometers, amounts to approximately half a million dollars. The cost to install a single permanent downhole gauge in an existing well is obviously much less.

Finally, Mr. Chairman, in the list of issues for this hearing, the Board requested comments regarding the need to file ID 99-1 applications in relation to existing uncompleted wells located in the RGS study area with produce status.

Petro-Canada understands that this issue concerns the requirement for an ID 99-1 submission regarding those existing wells that have been drilled in the Athabasca area or Wabiskaw formation but that are not yet perforated or on production. Petro-Canada offers the following comments on this final issue:

Any uncompleted well or zone in the RGS that was part of the filed evidence in this final proceeding, and receives approval status, should not require an ID 99-1 application.

Any other uncompleted wells or zones not subject to this proceeding should be required to submit an ID 99-1 application before it can be allowed production status.

If future information or data is obtained that would suggest a change to the production status of any well or zone, then an ID 99-1 application can be made by an interested party.

In closing, Mr. Chairman, new and more extensive pressure data and continuing studies provide a clearer understanding of the nature and extent of pressure communication between bitumen and associated gas. This evidence confirms widespread pressure communication across the Wabiskaw D shale and the A2 and B2 mudstones.

Petro-Canada's geological evidence provides an explanation of the communication pathways identified by the pressure data. It is generally recognized, certainly by the PCEJ owners, the SSG and CNRL, that associated low pressure gas pools put bitumen recovery at risk.

While the submissions of Petro-Canada have focused on Chard, the PCEJ owners are supportive of the SSG's recommendations for the Corner and Hangingstone areas as well.

Mr. Chairman, notwithstanding the physical volume of paper generated by Paramount in this proceeding, its modeling and conclusions cannot be relied upon by this panel.

In terms of policy, Mr. Chairman, pressure monitoring is necessary. Additional pressure data helps to reduce the number of geological interpretations. To quote Kurt Vonnegut: "New knowledge is the most valuable commodity on earth. The more truth we have to work with, the richer we become." [Kurt Vonnegut (1922-), Breakfast of Champions].

Mr. Chairman, Petro-Canada believes that upon review of the evidence before you there is one inescapable conclusion. The Board must stay the course to protect the significant bitumen resource that is affected by associated gas. In particular, to fulfill its conservation mandate, the Board must shut-in the gas pools from which the nine PCEJ application wells produce.

Subject to any questions from the Board, those are Petro-Canada's submissions.

THE CHAIR: No questions, Ms. Kolber. Thank you very much.

Mr. Block and Mr. McGovern, do you have an

11:58

estimate of what you need for your argument?

MR. BLOCK: I expect, Mr. Chairman, to be about an hour, slightly under.

THE CHAIR: Thank you.

MR. McGOVERN: Sir, my estimate is the same.

THE CHAIR: Is there anyone here from ISH? I take it there is not. We'll break now for -- sorry, sir. Mr. Mooney.

MR. MOONEY: Thank you, sir. We expect to be just under half an hour.

THE CHAIR: Thank you, that's helpful. We will resume at 1:15.

(Proceedings Adjourned at 12:00 p.m.)

PROCEEDINGS ADJOURNED TO AUGUST 11, 2005 AT 1:15 P.M.

1:15 p.m. Session.
August 11, 2005

THE CHAIR: Please be seated. Mr. Mousseau.

MR. MOUSSEAU: Mr. Chairman, in conversations with Board counsel, there wasn't a concern but there was a suggestion that perhaps the SSG might make available its copy of its argument to everyone because we provided it to the Board panel. And the SSG has no problem with that.

13:14

I take it that the concern that may be in parties' eyes is that there was material included in the written argument that wasn't potentially included in what I spoke. That, in fact, is true because we did put headings in there that I did not read in.

So what I can do, sir, is at the end of the day provide copies of that argument for everyone. So if there is a concern in that regard, it's dispelled.

THE CHAIR: Thank you, sir.

Mr. Block.

13:14

MR. BLOCK: Good afternoon, Chairman Dilay, members of the Board, and Board Staff. As you are well aware through Nexen's participation in this and previous hearings, Nexen is a bitumen producer in the Athabasca Oil Sands area through its interests at Long Lake.

In addition to the ongoing development at Long Lake, Nexen is the operator of bitumen leases at Leismer, which we referred to Jackfish, in earlier hearing, and in the Corner-Hangingstone area and is actively developing those leases. Nexen also holds working interests in bitumen leases at Corner, Chard and Hangingstone. Therefore, the outcome of the Phase 3 final hearing is important to Nexen's current oil sands projects and ongoing bitumen development strategy.

Nexen objects to gas production at 17 wells that are on or adjacent to Nexen's Long Lake bitumen property (Nexen February 14, 2005 Submission, Exhibit H-1) and seeks a decision of the Board that these wells be denied production status.

Second, Paramount challenges previous findings of the Board in an attempt to restore gas production throughout the Athabasca ID 99-1 area in some 203 wells and intervals. Such a decision, if granted, would materially impact Nexen's interests.

Commencing with the Public Inquiry in 1997, the Board has exercised its conservation mandate and charted a path for the overall maximization of the hydrocarbon resources in the Athabasca. The position of Paramount, simply put, is contrary to the public interest, and I'll certainly have more to say on that.

A brief word on the structure of Nexen's submissions. I will address the topics identified in the Board's letter of August 8 insofar as they pertain to Nexen, although not in the order listed in the letter. I will first address the 17 wells which Nexen seeks to have production status denied.

And of course at the heart of the production status of these wells is the competency of the Wabiskaw D shale as a regional barrier. I will then address the submission of Paramount.

I can advise I have provided a copy of my speaking notes containing citations to the evidence to the court reporter. I do not intend to read the citations but ask that the court reporter include the evidence cites in the transcript.

So a little history, at the Interim Hearing Nexen challenged the production recommendation on a total of 27 wells at Long Lake and at Leismer or Jackfish. Of these wells, 17 were allowed to produce, based on the Wabiskaw D shale as a perceived barrier between Wabiskaw C gas and underlying McMurray.

The Board in Decision, the Interim Decision 2004-45, recognized that well logs may not be definitive in determining mudstone thickness and character, and referred to the fact of insufficient core data. (Decision 2004-45, page 7). Thus, for the Final Hearing, Nexen supplemented the Long

Lake core evidence presented at the Interim Hearing, which was 18 cores, with core evidence from an additional 134 cores from the Long Lake bitumen development area.

The RGS, Regional Geologic Study for the 17 wells and essentially the entire Long Lake area mapped the presence of a unit that was called the Wabiskaw D shale in excess of half a metre, half a metre thickness based on logs. (EUB Report 2003-A, Figure 30: Wabiskaw D Shale Isopach Map). The 17 wells were allowed to produce under the Interim Decision (Decision 2004-045, Table 2) for the stated reason: "Regional mudstone/shale present," referring specifically to the presence and sealing capacity of the Wabiskaw D Shale as defined in the RGS. The SSG, at the Interim Hearing, had recommended that all 17 wells be allowed to produce, but at the Interim Hearing when under cross by Nexen, expressed concerns over the production status of the wells. (SSG Phase III Submission, February 14, 2005, Exhibit M-1, page 7). As a result, the SSG conducted a core-based study regarding the capability of well logs for determining the presence and thickness of Wabiskaw D Shale.

So scrolling forward in time. At this hearing, the SSG and Nexen are aligned. None of the 17 wells should be allowed to produce. The SSG and Nexen are in agreement that there exists no regional barrier at any of the wells. The wells, of course, are listed in Nexen's submissions, and I will not read them. I have included the wells in my speaking notes and ask the Court Reporter to include the wells in the transcript.

The Bitumen Evaluation Wells (7).

1AA/11-01-086-07W4/0
1AA/02-11-086-07W4/0
1AA/06-23-086-07W4/0
1AA/11-23-086-07W4/0
1AA/07-26-086-07W4/0
1AA/06-28-086-07W4/0
1AA/07-33-086-07W4/0

The Gas Wells (10).

100/05-07-084-06W4/0
100/06-09-084-06W4/0
100/05-10-084-06W4/0
100/07-16-084-06W4/0
100/09-17-084-06W4/0
100/03-18-084-06W4/0
100/10-20-084-06W4/0
100/10-21-084-06W4/0
100/13-27-084-06W4/0
100/15-17-085-06W4/0

Now, as I said, at the Interim Hearing, Nexen's evidence consisted of an analysis of 18 cores from the specific wells in question and from surrounding wells.

Nexen concluded that the Wabiskaw D shale, as mapped from logs in the Regional Geologic Study, did not constitute a regional mudstone barrier of greater than or equal to a half a metre in thickness at the Long Lake area, nor did the unit possess the characteristics of an effective barrier. (Interim Hearing, Nexen Submission, Exhibit K-2).

So what did Nexen do? Nexen significantly expanded its review for the Final Hearing. Nexen examined core from an additional 134 wells, representing a substantial proportion of the available cores from throughout the Long Lake lease.

And I pause there to say this: That, of course, the SSG has done a broader based regional study of Wabiskaw D. Nexen's focus was on Long Lake.

The results of the study are that the Wabiskaw D Shale thickness only meets or exceeds .5 metres in a total of five wells out of the 152 examined. Where the Wabiskaw D shale thickness meets or exceeds a half a metre in a particular well, Nexen is of the view that additional drilling within the same section or nearby is likely to reveal variations in thickness of less than half a metre.

In short, well control demonstrates that where the Wabiskaw D shale exceeds a half a metre in thickness, it is likely to thin to less than half a metre within the same section.

So turning to the RGS and the crossover with Nexen's study. Of the 134 wells examined by Nexen for this Final Hearing, the RGS tabulated the thickness of the Wabiskaw D shale from well logs at 98 of the same wells. Nexen examined the core data, where the RGS was based solely on log interpretation.

Overall, Nexen's conclusion is that the RGS log determination results in an approximate 140 percent overestimation of Wabiskaw D shale thickness, as compared to the thicknesses determined from core. Therefore, like the SSG, Nexen concludes that log character significantly overestimates the thickness of the Wabiskaw D shale as compared to actual thicknesses measured from core.

The core further demonstrates that the Wabiskaw D shale lacks the characteristics of a competent seal. It is interbedded with sand wherever it occurs, and bioturbation is common. Vertical burrows are widely present through the Wabiskaw D shale and are oil-stained, evidencing vertical communication pathways.

The issue of core loss was raised during the hearing, that was addressed by Nexen in its submissions. Core loss is not a significant factor on Nexen's submission in determining the thickness of this unit. Nexen noted possible missing core in 12 wells out of the 152 wells examined. (Transcript page 529, line 16 to page 530, line 3).

So a brief word on the SSG evidence. You've heard from the SSG. I'd like to expand because of the issue between some conflict or contradiction between Nexen and the SSG.

The SSG, in addition to Nexen, performed an extensive regional study of 232 wells in the RGS area where the log interpretation from the RGS or in the RGS had identified the presence of Wabiskaw D shale. (SSG Phase III Submission, February 14, 2005, Exhibit M-1, page 2). The SSG found that the Wabiskaw D shale was present in only 65 of the 166 cores that had complete core coverage.

Where the Wabiskaw D shale, as defined lithologically, and of course that's the key difference between Nexen and the SSG, was not present, the log response is due to a shaley or muddier pulse within the overlying Wabiskaw C. (SSG Phase III Submission, February 14, 2005 Submission, Exhibit M-1, page 16). In the remainder, the logs are reading a shaley part of the Wabiskaw D valley fill, or other lithologies (SSG Phase III Submission, February 14, 2005 Submission, Exhibit M-1, page 16).

The SSG observed that thin-bedded units of discrete Wabiskaw D valley fill, Wabiskaw D shale, and Wabiskaw C mudstone can be mapped in close proximity to one another at the same stratigraphic level. This indicates that there is a lack of continuity in these thin-bedded units and they are likely erosional remnants. As such, these units cannot be relied on as a regional barrier. (SSG Phase III Submission, February 14, 2005 Submission, Exhibit M-1, page 16).

Now where is the crossover between Nexen and the SSG. Nexen and the SSG examined 41 common wells. The SSG confirmed that the interval studied by Nexen is the same interval mapped by the RGS and called the Wabiskaw D shale within the RGS. That's the source of the confusion, members of the Board. Lithologically the SSG has determined that the unit mapped by the RGS and consistently identified and measured by Nexen was, in fact, the Wabiskaw C mudstone.

So, Nexen studied what the SSG would term the Wabiskaw C mudstone. Under cross-examination by the SSG, Nexen indicated that it understood and agreed with the basis for that terminology and had no opposition to that designation. (Transcript 00502, ll. 15, to 00506, ll. 11). Like Nexen, the SSG concluded that the Wabiskaw C mudstone is not a regional barrier.

The only unit identified as a potential regional barrier was the Wabiskaw D shale. And that, of course, was the reference that was made in the Leismer Chard decision. However, the RGS did not map the Wabiskaw D shale in the Long Lake area; it mapped Wabiskaw C mudstone.

In addition, the SSG, from its extensive core study, concluded that the lithologically determined Wabiskaw D shale and Wabiskaw D valley fill, likewise, cannot be relied on as regional barriers (SSG Phase III Submission, February 14, 2005, Exhibit M-1, page 16), and that only core examination is reliable for determination of the presence and thickness of the Wabiskaw D shale, and for discrimination between it and the other units that may cause similar log response (SSG February 14, 2005 Submission, Exhibit M-1, page 17).

On the basis of its study, the SSG changed its production status recommendations on 35 wells from "produce" to "shut-in," (SSG February 14, 2005 Submission, Exhibit M-1, page 17) and included within the SSG are Nexen's 17 wells.

So in the result, members of the Board subsequent to the Interim Hearing, both Nexen and the SSG conducted broad-based studies of the unit mapped by the RGS from logs as the Wabiskaw D shale. Nexen examined the precise unit that was identified in the RGS as Wabiskaw D shale from logs and formed the basis for the presence of an alleged regional barrier at Long Lake.

The RGS does not map Wabiskaw D shale at Long Lake; it maps Wabiskaw C mudstone. That unit has never been recognized as a sealing unit in any prior decision of the Board.

Further, Nexen's work at Long Lake establishes that the Wabiskaw C mudstone is not a regional sealing unit. The SSG concurs, and its work is fully complimentary to the work of Nexen, and is more regional in nature. And I wrote that before I heard Mr. Mousseau this morning.

The SSG examined on a regional basis the actual Wabiskaw D shale, lithologically defined, and in so doing also examined the distribution and character of the Wabiskaw C mudstone.

So the result is the same. The SSG finds no regional barrier in either the Wabiskaw C mudstone or the Wabiskaw D shale. Nexen's 17 wells are encompassed within the SSG's findings.

So a few final words on the work of the SSG and Nexen. Where the SSG had a concern over the validity of the RGS finding with respect to the interval in question, it did the work, as did Nexen, to investigate the concern.

And, further, this investigation involved core study. Cores were available and the SSG and Nexen analyzed them, and drew their conclusions from them. So, with that, I will turn briefly to CNRL's submissions regarding the Wabiskaw D shale.

Just very briefly, CNRL asserts that Nexen submitted no new evidence. This is incorrect. Nexen significantly expanded its core review and submitted the results of an examination of 134 additional wells in the Long

Lake area. The SSG submitted a review of 232 cores of a regional area that encompassed Long Lake. CNRL, in contrast, submitted no core examination and did not cross-examine Nexen. (Transcript page 640, lines 5-14)

As shown by Nexen's February 14, 2005 submission, the Long Lake area is being actively developed for oil sands evaluation and ample core is available, but CNRL did not examine it. So, CNRL submits no evidence but instead asks that the Board assume that the absence of core at an individual well in Long Lake somehow infers the presence of a seal, and further, asks that the overwhelming weight of evidence from cored Long Lake wells that show no seal be disregarded.

Despite that CNRL did not submit any core interpretations of its own to either the Interim Hearing or to the Final Hearing, CNRL urges, at least in it's written submission, that the evidence of both Nexen and the SSG should be disregarded, alleging "contradiction" and "inconsistency" (CNRL Phase III Reply Evidence, May 9, 2005, Exhibit C-6, page 30) in Wabiskaw D shale interpretation. It is clear through the core evidence and testimony of the SSG and of Nexen that each party studied a different interval: The SSG studied the lithologic unit described in the RGS as the Wabiskaw D shale, while Nexen studied the unit that corresponds to the log character of the unit mapped by the

RGS. The SSG, in its testimony, clarified that the subject of Nexen's study was the Wabiskaw C Mudstone, and Nexen agreed with this determination.

CNRL submits that the "inconsistency" should result in approval of gas production from the Wabiskaw C sand, despite that both Nexen and the SSG interpret there is no competent and continuous barrier, by whatever name, between Wabiskaw C gas and the McMurray bitumen. Both interpretations support the conclusion that gas should be shut-in in order to prevent pressure depletion in underlying bitumen.

Now, CNRL itself, and this is one of the points in my brief cross-examination of CNRL, relied on the RGS determination of the Wabiskaw D shale when it submitted a map of Wabiskaw D shale thickness over the Newby Wabiskaw T Pool in the Interim Hearing, and that was confirmed through our cross of CNRL. (Transcript, page 638, Line 1 to Page 640, Line 4) Thus it is clear that CNRL referred to the shaley response on logs as the "Wabiskaw D shale." So there is absolutely no confusion between CNRL and Nexen; both relied upon and used the nomenclature in the RGS.

In short and in summary, the evidence submitted by Nexen and the SSG is clear, and is neither subjective, inconsistent, nor contradictory. In fact, Nexen's and the SSG's evidence is wholly consistent and addresses head-on one of the pivotal issues in this hearing: Is there a regional barrier between Wabiskaw C gas and McMurray bitumen? The answer is clearly that no such barrier exists.

So, members of the Board, Board Staff, I'll now turn to Nexen's response to Paramount. So by way of introduction, Paramount submitted to the Board four specific pool studies. Now, relying on these four pool studies, Paramount asserts that gas production from some 203 intervals in 137 wells, and 56 pools, should be allowed to produce. And These wells span virtually the entire revised ID 99-1 area Exhibit H-8). And you may recall that Nexen introduced a map showing the location of the wells. Ninety of these wells are located in areas where the RGS has found that neither the A2 or B2 mudstones, the regional seals, are present. So there are no regional barriers. The balance of the wells are in pools that overlap the area where the A2 and B2 mudstones are not present, or are wells where gas is in contact with bitumen beneath a regional mudstone. (Transcript page 1596, line 12 to page 1597, line 11).

The wells sought to be produced overlie Nexen's interests at Corner, Hangingstone and at Long Lake. Paramount seeks that all gas be placed on production, both above and below regional mudstones.

Now, recognizing that the Board has and must assess risk, as we heard from Mr. Mousseau, in the gas over bitumen conflict, Paramount brazenly asserts to this Board that there is "no risk of sterilization of bitumen resource from continued gas production in the Corner and Hangingstone areas." (Exhibit I-1, page 5 of 11). During Nexen's cross, Paramount confirmed that the "no risk" position applies not only to the four pools but to all Paramount wells in the Athabasca. (Transcript page 1591, lines 21-24.)

Now, in our submission, Nexen's submission, Paramount purports to apply the RGS stratigraphy, yet denies the RGS' ultimate findings. Paramount repeatedly asserted that "The RGS geological model (January 2, 2004) was adopted for the purposes of this simulation and gas depletion sensitivity study." (Exhibit I-1, page 16 of 81) Paramount admits that gas is associated with wells subject to its four pool studies. But, it ignores that one of the ultimate purposes of the RGS was to identify the areas where there was a significant risk of vertical communication between underlying bitumen and overlying gas. As Chairman McCrank stated in GB 2003-28 stated:

> "The best available method to identify nonassociated gas production is through a regional geological study. The Board recognizes such a study is subject to change as new information becomes

available." (GB 2003-28, page 2 of 11)

And, of course, the study was done.

In the Athabasca, there is sufficient well density to identify the regional geologic model. That's where we are. That's been done. However, as this Board has held more than once, in the McMurray, there are rapid lithological changes over short distances, and the occurrence of thick, sand-filled channels is extensive and randomly distributed. (Decision 2003-023, s. 5.2.4., page 20; Decision 2000-22, s. 5.21.4, page 20)

Members of the Board, Nexen says the rapid variability of the McMurray and the presence of commercial bitumen is amply demonstrated on Paramount's own evidence.

So turning to that evidence and specifically the 2-D model studies, in its February 14 submission, Paramount took six 2-D slices from the geostatistical models of the four pools and ran simulations on them. On five of these slices, Paramount also replaced the geostatistically determined geology with a revised geologic description which consisted of clean sands in the lower two-thirds of the McMurray and then ran further simulations. So the two-thirds clean sand case.

And in Nexen's submission, Paramount's geostatistical 2-D studies appeared to target two propositions: First, commercial bitumen does not exist anywhere within the pools, and therefore gas production should be allowed (Transcript 1629, line 4 to Transcript 1630, line 3); second, even though the pools are located in the area where the RGS maps the absence of regional barriers, a steam chamber will be unable to interact with overlying gas due to Upper McMurray mud-prone facies. (Exhibit I-29, Slide 23).

So two key propositions, and I'll address each of them, Mr. Chairman. First the quality of the bitumen. Now, Paramount asserted to this Board, on February 14, 2005, and this is a quote, that,

> "the inherent geological properties of the host rock penetrated thus far in the Hangingstone and Corner area pose a serious impediment to potential bitumen recovery using SAGD technology."
> (Exhibit I-1, page 5 of 11).

Nexen submits that this assertion is patently incorrect on Paramount's own evidence. Paramount's initial 2-D, the initial ones prior to the clean fill, initial 2-D simulation runs on six slices from the geostatistical models yielded production rates ranging from 2 to 12 cubic meters per day per well pair. For example, for the Corner C slice, which was the 3-34-80-10-W4M well, Paramount predicted a production rate of about 5.4 M3/day and concluded that all wells in the Corner C pool (there is 8 gas wells in the pool the evidence will show) from all Wabiskaw-McMurray zones should be allowed to produce.

But, as I've referred to and the Board has repeatedly found, the McMurray is highly variable over short distances and the occurrence of thick, sand-filled channels is extensive and randomly distributed.

So Nexen, in the IR process, which was one of the pre-hearing issues, whether or not our process was useful, specifically asked what would a model show if it consisted of six other wells, all located in the Corner area. And Nexen submits to you that the results are telling. Paramount did not create an additional model, but provided a qualitative assessment. Production rates for five of the six wells ranged from 160 M3/day to 185 M3/day. (Exhibit H-3, Nexen IR to Paramount; Exhibit I-9, Paramount Response to Nexen) Paramount concluded that "the introduction of high quality bitumen saturated sand improved the results of the simulation runs drastically, with high oil production rates, high cumulative bitumen recoveries and low steam/oil ratios." (Exhibit I-9, IR Response to Nexen).

So that's the response to Nexen's IR to Paramount, and members of the Board, Board Staff, that is hardly surprising.

Nexen's six wells, through the IR process, are actual wells, drilled in the area of Paramount's studies, on gas well spacing. And five of the six wells were drilled by gas producers.

Now, members of the Board, critically, one of the six wells was the 5-35-80-10-W4M well. This well is in the Corner C Pool and is in the adjacent section to the 3-34 well. And the 3-34 was the slice that was actually alone. It is about 1300 metres away, the 5-35 from the 3-34. If a 2-D slice was taken through this well and simulated, the production rate (on Paramount's qualitative assessment) would be 175 M3/day. And, in fact, Paramount did prepare a slice through the 5-35 well, but did not present a simulation run, as established in Nexen's cross-examination of Paramount. (Exhibit H-11)

Now, in fact, members of the Board, Mr. Norris stated at the Hearing that the 5-35 well was the template for the lower two-thirds clean sand fill case. (Transcript page 798, lines 13-19). And we have been unable to located that statement anywhere in the February 14 submission of Paramount.

Now, Nexen submits to you that the slices presented on February 14, 2005, were selective. The Corner C gas pool overlies the bitumen at the 3-34 well and the 5-35 well, so we have a region of influence. Clearly, you have thick commercial bitumen, a template well, in potential vertical communication with overlying gas within a region of influence. And we say it is fully evident from Paramount's own submissions. Moreover, and this was I believe evidence of Mr. Norris, the occurrence of thick clean sands in the lower two-thirds of the McMurray is statistically probable. That's Mr. Norris' words. (Transcript, page 1073) And we say to you, members of the Board, it's not only statistically probable; it exists; it actually occurs at the 5-35 well directly in the Corner C pool.

So is there viable bitumen in the Corner C Pool? Absolutely. On Paramount's own evidence. Exhibit H-10 discloses all four pools, and the locations of Nexen's six wells for the IR process. The pools and wells are within or overlap the main channel trend. And the six wells are within the Corner/Hangingstone area studied by Paramount. Further bitumen delineation drilling will likely disclose further rich bitumen.

So I'd like to turn to vertical steam rise, and that was the second broad proposition that we took from Paramount's evidence, and rise to a thief zone or gas zone as depicted in Paramount's 2-D simulations.

So we start out by noting that in Paramount's evidence in chief in one of their slides (Exhibit I-29 - Slide 5), Paramount admitted that "These pools have associated gas…" We agree. And associated gas production in the main channel trend, where regional barriers have been removed, should not be allowed.

But we also say Paramount's own 2-D modelling depicts steam working its way through the upper muddy facies that are preserved in their models. The 2-D model runs were terminated at 7.5 years, or at contact with the thief zone. (Transcript, page 1644, line 15 to page 1645, line 2)

So we know that on the original geostatistical description only the 6-27 slice, and only that slice, did steam actually contact the overlying gas zone. At that time, the run was terminated. So as Petro-Canada has pointed out, interaction with the gas zone or thief zone was not fully tested. Well, then Paramount replaced the geostatistical model with the geostatistically probable clean sand in the bottom two-thirds of the McMurray.

What did Paramount's 2-D models show, and indeed their 3-D model which I will come to in a moment, in relation to vertical steam rise through clean sand? There is rapid steam rise through clean sand in the order of 20 metres per year. (Transcript, page 1628, lines 9-16). That was part of our cross-examination of Paramount.

Three of the five 2-D models, in which the clean sand case was run, show breakthrough to the McMurray Al gas within three and a half to five and a half years. Breakthrough to channel gas which, of course, is lower, which

Paramount also seeks to produce, occurs much earlier, in one and a half years at the 3-34 slice. (Transcript page 1645, lines 23 to page 1646, line 4).

So Even where there is clean sand in the bottom two-thirds of the 2-D models, the geostatistically generated upper muddy zone or upper muddy facies was retained. So where a steam chamber forms in clean sand, which, of course, is the target for bitumen development, there will be steam breakthrough into overlying gas zones through an upper McMurray muddy-prone facies.

Simply put, the Paramount models show that if the steam chamber contacts the upper McMurray zone sooner, the steam chamber penetrates through and contacts the thief zone within the run time of the model. This is nothing more than a variation of the baffles versus barriers argument that the Board has heard so much of in previous hearings.

And of course, and I hasten to add once again, that the 5-35, an actual well, was apparently the template for the two-thirds clean sand fill case. Clearly, Paramount's evidence shows that gas is associated, steam will contact the thief zone within the life of a SAGD project, and there is economic bitumen.

So turning from 2-D modelling to geostatistics. Paramount appears to assert before you that this technique is superior to other evidence, is new and is predictive. Nexen disagrees, and we have six major areas of disagreement.

First, one well per section spacing does not provide an appropriate basis for the application of geostatistical modelling in the Athabasca. Gas well spacing cannot fully represent the vertical and lateral variability of facies in the McMurray.

Nexen agrees with Paramount when it states:

> "In potential SAGD project areas, reservoir modelling is normally performed in the late exploration stage of a potential production site using closely spaced cores as the control for determining reservoir facies."
> (Exhibit I-1, page 26 of 81).

As stated by Ms. Skulski when questioned by Paramount, Nexen does not use geostatistics in the Athabasca. When asked why by Board Staff, Ms. Skulski responded that by the time the heterogeneity of the McMurray has been defined by sufficiently dense drilling, up to 16 wells per section, the need for geostatistical modelling is moot. (Transcript page 541, line 1 to page 542, line 2).

Second, as with all models, the inputs determine the results. Geostatistical modelling is no different. As shown by Nexen's IR and Paramount's response

(Exhibit H-3; Exhibit I-9), had Paramount constructed a model consisting of six bitumen channel wells from the immediate area, five of the wells, and the model overall, would have demonstrated very high, clearly commercial bitumen rates and rapid breakthrough.

Third, if the small set of wells chosen to construct the model do not display clean channels in the upper McMurray, the result of geostatistical distribution in the inter-well area is a preponderance of muddy facies. The geostatistical models, as constructed, are not capable of inferring geological possibilities that are not part of the input. In other words, the models are not capable of showing the randomness of channel development, if the original input wells are not of great enough number with sufficiently varied vertical facies distributions to accurately and fully sample the heterogeneity of the McMurray.

Fourth, Paramount appears to assert that the grid size used in the models preserves heterogeneity and infers accuracy to the model results. However, when the wells used in the model underrepresent the presence of thick, clean bitumen-filled channels or of upper gas-filled or wet channels, then the effect of a very fine grid size, 50 metres laterally and .5 metres vertically, is to minimize the possible height and width of any channel sand accumulation.

For example, the 2-D slice prepared by

Paramount through the 5-35-80-10W4 well, Exhibit H-11, shows that the 5-35 wellbore geology as only 100-metre wide vertical column along the given plane within the model. Geostatistically inferred heterogeneities, or in other words muds, begins to be introduced into the immediately adjacent 50 metre by 50 metre cells on either side, despite that the nearest actual well is 800 metres away. Thus the size through the geostatistics of an economically viable bitumen accumulation, or of a clean sand accumulation in general, is minimized by Paramount's geostatistical methodology.

Fifth, Paramount has separated the facies model from the porosity model in each geostatistical model study. Porosity is not tied to facies but is derived strictly from logs at a vertical interval of .1 metres, and then statistically distributed. Permeability is determined from, in Nexen's submission, a pessimistic porosity-to-permeability relationship.

Petro-Canada has addressed the porosity-to-permeability relationship, and I will not repeat their submissions. We will highlight an example of the result of Paramount's calculated permeabilities. And this was again part of Nexen's cross.

The result of the calculation is that even where wells with obvious sand-filled channels through the upper McMurray were incorporated into the Paramount models, such as the McMurray G Pool, permeability is minimized. The 100/10-11-81-10W4 well demonstrates this. Paramount showed a facies determination and permeability assignment for this well, the 100/10-11 well. (Exhibit H-13).

Under cross-examination by Nexen, Dr. Ranger agreed that a 12 metre thick channel sand was present in this well in the upper McMurray, and that permeabilities as low as 9 millidarcies and no higher than 320 millidarcies were assigned through the upper part of it, despite that no interbedding of mud was inferred from the facies assignment (Transcript, page 1647, Line 19 to page 1648, Line 22; page 1649, Line 14 to page 1657, Line 5).

Mr. Norris confirmed that these values were in fact horizontal permeabilities (Transcript, page 1655, Line 17 to 1656, Line 5). Thus, after applying the Paramount calculation to derive vertical permeability (Exhibit I-1, Appendix 8, page 83), a clean channel sand would be assigned even lower vertical permeabilities. This is not withstanding the fact that Dr. Ranger interpreted clean sand facies with high vertical permeability (Transcript, page 1647, Line 19 to 1648, Line 22).

And Mr. Engelman agreed that if a model was run that combined the clean channel sand at the top of the 100/10-11 well with the thick clean channel sands at the 5-35 well, wells that are two miles apart, the result would be clean sand over clean sand and rapid steam rise to a gas zone. (Transcript, page 1663, Lines 4-22).

So, in the result, Mr. Chairman, members of the Board, Dr. Ranger interprets clean sand, Mr. Engelman confirms rapid steam rise through clean sand, and Mr. Norris confirms that channels occur stratigraphically at any level in the McMurray (Transcript page 1663, Line 24 to page 1664, Line 6).

Six, the geostatistical models presented by Paramount are not predictive. Mr Norris stated under cross-examination by Board Staff (Transcript, page 1781, Line 2-17), and this is the quote:

> "You would never use a map such as that to drill or plan a pilot because it would change on the next realization."

Nexen agrees that in order to delineate a bitumen resource within any of the pools modelled by Paramount, delineation drilling would have to be done.

The Paramount geostatistical modelling does not predict the locations and sizes of exploitable bitumen deposits nor of chimney wells. The RGS is the predictive tool; it delineates where regional mudstones are present and where they are absent and where thick bitumen channels are likely to occur.

In conclusion, Nexen submits that the

Paramount modelling starts with an incorrect application of geostatistics to areas with inadequate well control. But in the end, despite the flaws in the methodology that you have heard this morning, through the hearing, and the ones that are set forth in Nexen's submission, the 2-D simulation slices through the models demonstrate commercial bitumen and vertical communication. And in the result, the Interim Decision of the Board, for all Paramount wells, should be confirmed and made final by this Board.

I'd like to turn briefly to 3-D modelling. Paramount ultimately submits that depleted gas pressures have no effect on ultimate bitumen recovery. They make this assertion based solely on 3-D models, various iterations of the 3-D model, without any field evidence. Paramount then extrapolates the argument to all its wells in the Athabasca ID 99-1 revised area, and asserts that all should be permitted to produce.

Of course, members of the Board, this is not a new issue. It is not even a new approach to an old problem. It is a generic model unsupported by any field evidence. Paramount simply presents another low pressure SAGD argument. And low pressure SAGD, as a mitigative measure, has been canvassed at length at the Public Inquiry, at Surmont, and most recently in the Leismer/Chard Hearing and the Board has made findings.

Now, the Board's response has been consistent and clear. The risk to bitumen recovery caused by gas depletion is contrary to the public interest. Mitigative measures must be proven and practical based on field evidence, (EUB Decision 2000-22, page vi; EUB Decision 2003-23, page vi), and there are a series of decisions that say exactly that.

In addition, none of the myriad of other issues that surround low pressure SAGD, such as lift and water influx, were addressed by Paramount. The Board has found that the less gas zone depressuring that occurs the better, as minimizing such depressuring would better ensure successful SAGD operations in terms of resource recovery, minimize the costs and technical difficulty of lifting SAGD fluids (EUB Decision 2000-22, page 79). In Nexen's submission, members of the Board, that finding is unassailable.

Chairman Dilay, throughout the hearing, asked each panel what is the status of technical solutions? Are there any? Mr. Norris, on behalf of Paramount, on August the 8th, responded "nothing struck me as breakthroughs as such, Mr. Chairman." (Transcript, page 1910, line 18 to page 1911, line 11). And we concur.

The Board's approach is fully consistent with its conservation mandate. If you need a mitigative measure like low pressure SAGD, or repressuring or any of the other, the damage may have already been done. Therefore, it must be established on credible evidence that a potential mitigative measure actually works before it can be relied upon.

I would like, members of the Board, to offer a brief word on field evidence that was introduced by Paramount. Nexen found it interesting that Paramount, in its evidence in chief, referred to the most recent Resource Management Report or RMR filed by ConocoPhillips and the fact of hydraulic communication at the Surmont Pilot. And of course the RMRs flow out of the Surmont Decision 2000-22. In other words, simplistically stated, the steam chamber is approaching the thief zones at Surmont. But in previous hearings, the Board heard evidence and arguments that there existed barriers to vertical communication between bitumen and overlying thief zones at Surmont. And we see that recorded and memorialized in Decision 2000-22, at pages 17 and 18. So clearly steam has found its way through, or around any perceived geologic barriers at Surmont.

The second field evidence. Paramount raised in cross the Long Lake project. It is undoubtedly a SAGD project so there can be no dispute like that which surrounded the Kearl Lake pilot that's recorded in your earlier decisions. And what has the pilot shown? As stated by Ms. Skulski, and this is a quote:

> "Everything we're seeing at the pilot is totally supportive of the Board's findings to date." (Transcript, page 521, Line 18 to 22).

What happened? Nexen hit a thief zone. It suffered very significant steam losses. It attempted to maintain its original intended operating pressure of 2750 kPa and "power through" the lean zone. Nexen was unsuccessful. The zone was essentially infinite-acting. Nexen was forced to match pressures to the thief zone to control loss of steam. In the result, reduced operating pressures have resulted in lower production rates per well and operational difficulties. (Transcript, page 521, Line 18 to page 523, line 6, Exhibit I-23, page 12).

Now, I hasten, members of the Board, to add this, the lean zone encountered at Long Lake is a naturally occurring thief zone. It is down in the reservoir. The issue that has been before the Board for some nine years now is whether pressure depletion, through preventable gas production, creating low pressure thief zones, should be allowed.

So is there at least some field evidence? Yes. The Surmont Pilot has demonstrated vertical steam rise. ConocoPhillips continues to operate the pilot beneath the depleted thief zones at Surmont. At Long Lake, the pilot hit a lean bitumen zone. It suffered loss of steam, and is now operating at lower pressure with lower temperatures and lower rates.

A brief word on the 3-D models themselves. Members of the Board, Board staff, the equation is straightforward. Essentially, it's the only questions I put to Dr. Ali. Lower pressures mean lower temperatures. Lower temperatures mean higher viscosity and lower recovery. If the steam chamber breaks through to a depleted gas zone, or a thief zone, you must balance steam zone pressure to the overlying thief zone.

And the Board has consistently found that lower pressure means lower recoveries and increased difficulties. And it is this basic core finding that Paramount challenges after all of this paper and all of this analysis. That is what is at issue.

As the Board is well aware, Paramount was asked by Board Staff to re-run its 3-D model. Board Staff summarized the results in Exhibit A-3. And in Nexen's submission, Cases 3 and 6 are particularly telling. When the Exotherm model is run and allowed to generate its own well indices, the result is higher oil recovery and lower cumulative SORs at a higher pressure within each of the time periods examined. After four years, the cumulative bitumen recovery is 38.6% (for the high pressure case) versus 23.6%

(for the low pressure case). The cumulative SOR is 2.16 (for the high pressure case) versus 3.41 (for the low pressure case).

And of course the exhibit, Mr. Chairman, will speak for itself. The only reason that I focus on cases 3, 4 and 6 in the four-year period, of course that's the start-up period for SAGD projects when it is important to get these projects up and running.

Now, you've heard the SSG and Petro-Canada on the numerous errors within the Paramount 3-D model. I will not repeat them. Fundamentally, generic modelling is not a new issue and is not a new look at an old issue. The Board has extensively analyzed modelling evidence over three major hearings. When re-run, the Paramount 3-D models demonstrate the obvious: Higher operating pressure means higher bitumen recovery. The Board's previous decisions are sound and fully consistent with its conservation mandate. Gas depressurization should not be allowed when its effects may be irreversible. Any mitigative measure must be proven and practical on field evidence. Although work is ongoing, technical solutions do not yet exist.

A few miscellaneous comments, members of the Board, Chairman Dilay. Pressure monitoring requirements: The Board has requested that parties address pressure monitoring. As far back as Surmont, the Board expressed the willingness to work with parties to establish a pressure monitoring program. The Board has declined, thus far, to implement a pressure monitoring program. There are clearly issues of cost and, in addition, correct and useful data must be collected. So it's not only a cost issue. We have to get the right data. Nexen supports the implementation of a pressure monitoring program, following a period of consultation with industry.

ID 99-1 applications for uncompleted wells: The Board has also requested comments on the need for ID 99-1 applications for uncompleted wells in the RGS area that have been given a "produce" status.

Nexen is of the view that the ID 99-1 application rules continue to apply to new completions.

In this hearing, Nexen is objecting to 10 bitumen evaluation wells, which under Decision, the interim decision, 2004-045, were given "produce" status. For these wells, the decision must first be made on the evidence which is before the Board, and that is, we say, that there are no geologic barriers between Wabiskaw C gas and McMurray bitumen in any of the wells. These wells are in what the RGS calls undefined pools, meaning no production has occurred, no pressures have been measured, and no region of influence mapping has been generated. The requirements of ID 99-1 should not be sidestepped simply because the wells have not been completed. The SSG this morning, and certainly at the Interim Hearing, confirmed its view that the ID 99-1 applications remain necessary.

So in conclusion, members of the Board, Board Staff, the gas over bitumen conflict has had a long and we would say intense history. It has spawned at least four major hearings, including this one, two of which were among the longest, if not the longest, ever heard by the Board.

Throughout, the Board has consistently applied a fundamental principle arising from its mandate: It must consider a broader set of issues than the immediate plans of any one company or industry sector.

Guided by that principle, the Board has weighed evidence and made decisions. It has provided direction as to its role, its mandate, and its expectations for industry. The stakes are high for all parties. No one denies that. The evidence is often conflicting. Through it all, since Gulf initially filed the first shut-in application way back in November of 1996, the Board has charted a path for the overall maximization of the hydrocarbon resources in the interests of all Albertans. That's what's at stake, is that overall maximization of the resource.

Paramount has advised you that "we were mindful of what the Board had written in previous decisions..." (Transcript Page 782, line 8-10). Yet, Paramount also asserts that there is no risk to ultimate bitumen recovery through continued gas depletion. Paramount claims to honour the RGS, yet at the same time seeks to have placed on production some 203 wells and/or intervals in some 56 separate pools, the bulk of which wells are located directly in the channelized area where the risk of vertical communication is unacceptable. It does so without any field evidence. The Board has held that it would not be in the public interest to accept the possibility of sterilizing vast bitumen resources by allowing continued gas production. (Surmont, Decision 2000-22, page vii). So that's the risk issue.

Now, CNRL did not present any evidence on the areal extent or thickness of the Wabiskaw D shale, but rather asserts that there is confusion between Nexen and the SSG and hence the Board is paralyzed, it should not act. Members of the Board, the undeniable fact is that there is evidence before the Board, and this new evidence compels the Board to act.

Gas production has been halted and pressure depletion arrested in many wells through the previous decisions of the Board, including the Interim Hearing. Gas production can be reinstated when it is demonstrated on credible evidence to be in the public interest to do so. The evidence before you falls far short of establishing that it is in the long-term public interest of all Albertans to recommence gas production.

Thank you, members of the Board and Board Staff. That concludes the submissions of Nexen, subject to your questions. And I particularly thank you for your patience and courtesy since I first stood before you on gas over bitumen issues in 1997. Thank you, subject to your questions.

THE CHAIR: No, questions, Mr. Block. Thank you.

MR. BLOCK: Thank you.

THE CHAIR: Mr. McGovern.

MR. McGOVERN: Thank you, Mr. Chairman, and good afternoon.

By way of introduction, let me state that Canadian Natural is both Canada's second largest thermal bitumen producer and second largest natural gas producer. Canadian Natural, therefore, has interests on both sides of the gas over bitumen issue. Canadian Natural and its predecessor companies have participated in all of the GOB hearings to ensure that gas is allowed to produce where it does not pose a threat to bitumen and that, where necessary, potentially recoverable bitumen is reasonably protected.

Canadian Natural does not believe that the gas over bitumen issues can be fairly and properly addressed by simply shutting in all gas production. Canadian Natural continues to support a decision-making process that ensures that the decision to shut in a well is based on an examination of all the data on a pool-by-pool basis. The geology in the area of concern is complex and can only properly be considered on a pool-by-pool basis.

The decision to shut in gas requires the Board to make at least 3 findings: Firstly, a determination of the pool in question (pool delineation); secondly, that there is potentially recoverable bitumen; and thirdly, a determination of whether there is "association within the region of influence."

The determination of whether Canadian Natural's wells in dispute in this final hearing should be shut in, require the Board to determine whether there is association and whether there is potentially recoverable bitumen. Canadian Natural has presented evidence on these issues, both in a general sense and with respect to particular wells and pools.

Is there Association in Canadian Natural's Wells? Petro-Canada's position is that approximately 80 wells that have previously been allowed to produce should be shut in because the regional McMurray mudstones cannot be relied on as seals. What evidence does Petro-Canada rely on in support of this position? Firstly, we have Mr. Fong's position that underlies all of Petro-Canada's submissions since the Surmont hearing. That position is that all gas in the area of concern should simply be shut in. It is a position that has been argued repeatedly in the past and repeatedly rejected by this Board.

In this hearing, Petro-Canada simply asserts that the regional McMurray mudstones cannot be relied on as seals and then requests that nine of Canadian Natural's wells be shut-in. In Decision 2003-023, however, this Board, after examining segregated pressure data, fluid distributions and the areal extent of the mudstones, concluded that the regional McMurray mudstones do act as seals.

Petro-Canada fails to provide any evidence to support its assertion that the data relied on by this Board in the Chard decision was improperly interpreted or that the conclusions reached therein were incorrect. If Petro-Canada has evidence that the regional McMurray mudstones lack sealing potential, why does it request that only nine wells be shut in? Canadian Natural believes that when the evidence from all pools is properly examined, it is clear that these regional mudstones do act as seals and that there is no reason to change the Board's previous ruling in that respect.

One would also expect that since Petro-Canada has requested that only nine of the hundreds of wells containing the regional muds be shut-in, Petro-Canada would have evidence that those particular wells were problematic. However, this is again not the case. Petro-Canada provides no evidence from the 9 wells that it requests be shut-in. Rather, it relies on geologic and pressure data that is not derived from the wells that it seeks to have shut in.

And what does the data presented by Petro-Canada show? In the first Chard hearing, the Board concluded that "where present, the McMurray A and B mudstones act as barriers to vertical pressure transmission" (Decision 2003-23, Pg. 20). The Board based this finding on "the areal extent of the McMurray A and B mudstones relative to the size of the overlying gas pools and top water zones, the distribution of reservoir fluids within the sands, and pressure data from segregated gas zones" (Decision 2003-23, Pg. 20).

In the RGS study, stacked fluid contacts were widely recognized and the regional muds were mapped across the study area. The material submitted by Petro-Canada fails to provide any specific evidence that the nine wells it has selected for shut-in lack these regional seals, and has particularly failed to demonstrate the absence or breach of these seals in the region of influence. Most of the geologic arguments presented by Petro-Canada have been previously considered by this Board, such as the potential for erosion of these regional units.

Those arguments not addressed previously do not withstand scrutiny. Petro-Canada asserts that the long-recognized structuring of the McMurray is indicative of widespread faulting which renders the regional McMurray seals ineffective. The regional Mannville anticline, which marks the edge of the deeper salt dissolution edge, acted as the up-dip trap for hydrocarbons migrating into the Mannville.

This is demonstrated by the bitumen zero edge being largely coincident with this feature. Thus, the majority of structuring predates emplacement of oil and gas.

If structurally induced faulting were common, it would have been present during hydrocarbon emplacement and one would not expect to see the stacked fluid contacts that are so widespread in the McMurray. Similarly, later structuring would be expected to provide pathways by which top water and gas should equilibrate. Again, the observed fluid distribution does not support this conclusion.

A more reasonable interpretation is that the unconsolidated sediments exhibit a more plastic deformational behavior and have not been breached, rather than the bittle failure suggested by Petro-Canada. Nor can the pressure data submitted by Petro-Canada in support of the requested shut-in be relied on.

Firstly, none of the data presented is derived from the wells requested for shut-in. Secondly, of the four pressure cases presented, two are from wells in which the regional shales are absent. These cases, therefore, do not assist the Board in determining whether there is association. The two remaining cases are more reasonably explained by maintaining the integrity of the regional McMurray mudstones.

The first of these two pressure cases is largely based on a pressure recording from 11-33-79-7W4 taken in 1999. In order to accept Petro-Canada's interpretation, the source of depletion of this well must be ascertained. Numerous possibilities other than those put forward by Petro Canada were presented in the submissions, or were discussed in cross-examination by Board Staff (Transcripts, pages 412-420). As admitted by Mr. Stabb on page 415 of the transcripts: "There are a number of scenarios that could be in play."

The interpretation presented by Petro-Canada is clearly not the only explanation, or even the most likely for the data recorded. A simpler and more reasonable conclusion is that the recorded pressure is a result of the general depletion of the Leismer Wabiskaw McMurray A Pool. More importantly, however, the lack of a unique solution means that this case is ambiguous at best, and cannot be taken as evidence supporting the shut-in requested by Petro-Canada.

The second case put forward by Petro-Canada as proof of the failure of the McMurray regional mudstones relates to the piezometer data from the 10-14-79-7W4 well. Canadian Natural has documented the peculiarities of the data recorded by these instruments. These gauges take months, rather than the days observed in other wells, to reach equilibrium with the reservoir. They record pressure events that clearly do not reflect reasonable pressure behavior in the reservoir. Based on this material, Canadian Natural submits that these gauges are not operating properly and the data cannot be relied on.

Even if one were to assume the data was valid, the initial maximum recorded pressure in the water zone underlying the regional mud is essentially virgin resulting in a huge pressure differential across the regional mud that is purportedly leaky.

Furthermore, the water zone pressure trend observed suggests that the decline is recent in origin. Again, Canadian Natural submits that if the data is valid, it shows that the seal was effective until the 10-14 well was drilled.

The recorded decline is more reasonably explained by behind-the-pipe communication in the 10-14 wellbore. When the Petro-Canada panel was questioned as to whether there could be other possible sources of depletion, it stated: "There are several interpretations that could be put forward here." (Transcripts Pg. 443).

Canadian Natural contends that the data from this pressure monitoring installation is suspect and ambiguous at best, and does not support Petro-Canada's request for shut in.

In summary, the two inconclusive pressure cases put forward by Petro-Canada do not warrant this Board rejecting the regional muds as seals. Similarly, the faulting argument is not compelling. Canadian Natural believes that this evidence does not support a change to the status of the regional McMurray muds as a seal, nor the production status of any of the wells listed by Petro-Canada.

In our submission, the Board's conclusions in Chard relating to the McMurray regional muds must stand. Petro-Canada has failed to demonstrate that the regional muds are not seals, and has offered no evidence to demonstrate that the regional sealing muds in the wells it is requesting be shut in are not present. Accordingly, Petro-Canada has failed to provide any basis for the Board to change the production status of these wells.

Nexen and the SSG have both made submissions respecting the Wabiskaw D shale. Both Nexen and the SSG, based on their evaluation of core, suggest that this unit is not a seal. In making this request, Nexen and the SSG are, in essence, asking the Board to ignore all past evidence as to the sealing capability of the D shale and to make a ruling that would foreclose the possibility of making such considerations on a pool-by-pool basis.

Further, such a ruling would not only affect wells where core evidence supports the shut in of gas zones, but also wells where core or other evidence does not support such a decision, wells that are not cored, and all future wells drilled in the area. Such a sweeping decision must be supported by comprehensive and unequivocal evidence, which is not the case here.

In Decision 2003-023, after months of hearing evidence, the Board concluded that:

> "The McMurray A and B mudstones act as barriers to vertical pressure transmission and, therefore, that pressure depletion of gas zones overlying these mudstones should not be transmitted to underlying sediments. This conclusion is based on the areal extent of the McMurray A and B mudstones relative to the size of the overlying gas pools and top water zones, the distribution of reservoir fluids within the sands, and pressure data from segregated gas zones."

(Decision 2003-023, Pg. 20).

In relation to the Wabiskaw D shale, the Board went on to state:

> "Based on similar observations, the Board also believes that the Wabiskaw D shale, where present, acts as a barrier to vertical pressure transmission, such that pressure depletion due to production of gas from above the Wabiskaw D shale would not be transmitted to the sands below the shale." (Decision 2003-023, Pg. 20).

The Wabiskaw D shale described in the Chard decision was a mud-dominated unit defined from logs. The Board recognized that this muddy unit could be mapped regionally, and was associated with fluid distributions and segregated pressures that demonstrated isolation. Accordingly, it was concluded that the Wabiskaw D shale is a seal.

The request by Nexen and the SSG in this hearing that the Wabiskaw D shale be rejected outright as a seal asks that all of these observations be ignored and the previous findings reversed. Nexen and the SSG do so without providing evidence that the observed distribution of fluid contacts and segregated pressure data are incorrect.

Canadian Natural believes those previous findings should not be ignored and should not be reversed without compelling evidence to the contrary.

The RGS mapped the Wabiskaw D shale in the same manner as was done at the Chard hearing; almost exclusively from logs. Thus, the RGS-mapped Wabiskaw D shale is consistent with the Wabiskaw D shale from the Chard hearing where the fluid contacts and segregated pressures were observed.

The RGS also provided a lithologic description of the Wabiskaw D shale. It is that description that causes many of the problems. The core evidence of the SSG demonstrates that the muddy interval mapped from logs in both the Chard hearing and the RGS contains at least two types of mud, referred to as the Wabiskaw D shale and the Wabiskaw C mud by the SSG. Thus, the lithologic description in the RGS does not cover the range of facies found in the interval mapped from logs in the Chard hearing and the RGS.

Since the lithologic description in the RGS only describes one of the components of the log-mapped Wabiskaw D shale, a number of issues arise.

Firstly, the relationship of these two facies to one another must be determined. Are they two distinct depositional units separated by an unconformity as suggested by the SSG? If this is the case, what reasonable geologic process would erode and deposit a new mud so similar in thickness and log character that they are unrecognizable on logs? Could these two mud types simply be two end members of a single depositional unit, one deposited in anoxic areas, the other in a less restricted environment? These relationships must be understood to assess continuity.

Next, one must know which of these lithofacies acts as the sealing unit observed in the Chard hearing. Neither the SSG nor Nexen made an effort to confirm which of the lithofacies observed, D shale or C mud, were associated with the fluid distribution and segregated pressures referred to in the Chard decision. Without this step, there is no way of knowing whether the C mud is the seal, the D shale is the seal, or most likely, that both act as a seal. Such an analysis is a critical step to determine which lithofacies must be measured in core to evaluate the seal thickness.

The SSG position regarding the thickness of the Wabiskaw D shale is based on only that portion of the Wabiskaw D shale that conforms with the lithologic definition set out in the RGS. In so limiting its analysis, the SSG assumes that this unit is the only muddy facies that acts as a seal.

The unit described by the SSG as the Wabiskaw C shale was not considered to have any sealing potential, and was not documented. Without knowing which of the muds act as a seal, there is no way to determine which unit thicknesses should be considered, or whether they should be combined. Since the SSG indicates that in almost half the wells examined the Wabiskaw C mud was responsible for the log response mapped in the RGS, this issue is clearly material.

Similarly, as was clearly demonstrated in the Board Staff's cross-examination of Nexen, not all of the muddy interval found within the RGS-mapped Wabiskaw D shale was considered by Nexen. When questioned on the core photo for 3-1-86-7, transcript pages 534 to 536, Nexen admitted it did not consider the mud above the McMurray and below the "Nexen described" Wabiskaw D shale in its evaluation.

In summary, without first determining which lithofacies within the log interval identified as the Wabiskaw D shale in the RGS is the sealing unit, there is no way to determine which units in core must be measured. Without this step, it is not possible to determine if the measurements of the SSG and Nexen are in any way indicative of the sealing potential of the D shale interval.

Furthermore, since the lithologic definition in the RGS only describes one of at least two mud facies found within the log-derived Wabiskaw D shale interval, it is not surprising that there would be a poor correlation between log and core thicknesses. A more appropriate comparison would be to include the Wabiskaw D shale and C mud lithofacies and compare this to the log thicknesses. Once again however, without knowing which mud facies act as the seal, this analysis is also not determinative.

The actual thickness data presented by both the SSG and Nexen also reflects many of the other difficulties posed in using core to measure the Wabiskaw D shale thickness. As documented in the May 9th submission of Canadian Natural, there are a number of pitfalls that make the use of core data more subjective and prone to error that may initially be thought.

The potential for lost core and the subjectiveness of picking tops and bases of thin units can significantly impact the interpreted thickness of the Wabiskaw D shale. This, in turn, can and does generate contradictory values from different geologists viewing the same core. The incomplete lithologic description of the log-derived Wabiskaw D shale interval in the RGS is likely partially responsible for these discrepancies.

As the RGS lithofacies definition was incomplete, the geologists were forced to improvise their own definitions to fit the observed core. This results in divergent interpretations, and is manifest in Nexen's response to the Board Staff information request EUB-Nexen-1, April 11, 2005.

In the description of how the Wabiskaw D shale was picked, Nexen presents both the RGS definition, as well as its own. The RGS description refers to,

> "a true fissile shale, dark blue-grey in colour, commonly displaying platey fractures in core."

Nexen's definition refers to a,

> "thin interbedded unit of sand, silt and mud, of variable grey colour, that may display some cracking and platiness in muddier sections."

These definitions differ, and the result is the discrepancy documented by Canadian Natural in its May 9 submission. In the 44 wells where both Nexen and the SSG looked at the same core, more than one-half the time they did not agree as to whether the Wabiskaw D shale was present or not. The subjective interpretation of the core is also evident in the thickness discrepancies in the four wells where both Nexen and the SSG recognize the Wabiskaw D shale. Again, Canadian Natural's May 9th submission documented that the discrepancies in these wells range in magnitude from 1.5 to 3 times.

There has been some suggestion that the Wabiskaw D shale documented by Nexen was, in fact, the Wabiskaw C mud, while the SSG documented the true D shale, the suggestion being that these two studies do not contradict one another, and may in fact be complimentary. Although this view neatly deals with some of the observed inconsistency, Canadian Natural believes this is extremely unlikely. Although the Nexen definition might count some portion of lithofacies called Wabiskaw C by the SSG, it should certainly also include all of the Wabiskaw D shale of the SSG. Thus, the measurements of the two groups cannot easily be disentangled to create a clear picture. Furthermore, in the four wells where both groups report Wabiskaw D shales, in three of the four cases the Nexen-reported thickness is less that the SSG's, despite supposedly including the Wabiskaw C mud (Canadian Natural: May 9th submission, figure 27).

In summary, the data submitted by the SSG and Nexen does not establish the relationship between the lithofacies and does not identify which lithofacies act as a seal. Without this step, the data presented cannot be interpreted in the manner requested by the SSG and Nexen. This is further compounded by the subjectivity inherent in the analysis that results in the inconsistencies and discrepancies documented in Canadian Natural's May 9th submission. Given these shortcomings, the case put forward by the SSG and Nexen falls far short of the evidence that this Board should demand before it makes the sweeping finding requested. The fluid contact and segregated pressure evidence described in Decision 2003-023 demonstrated that the

Wabiskaw D shale does act as a seal. Any new hypothesis put forward must not simply ignore these observations. As such, the general finding that the Wabiskaw D shale is a seal where present and greater than 0.5 metre of thickness should stand.

It continues to be the position of Canadian Natural that gas pools must be examined on a pool-by-pool basis. When each of the pools the SSG and Nexen seek to have shut in is examined in this manner, the evidence submitted does not support the shut in requested.

Nexen requests that seven Canadian Natural operated gas wells be shut in. Six of these are located in the Newby Wabiskaw T pool. The pool was examined in detail at the interim Chard hearing in 2004. After examining all of the available log and pressure evidence, the Board concluded that this pool was isolated from McMurray bitumen and should be allowed to produce. There is no core from this pool. The nearest core submitted by Nexen in this hearing is located more than six miles to the northwest. Thus, there is no new evidence pertaining to this pool. Canadian Natural contends that with no new evidence from this pool, there is no basis to change the production status of the pool and it should continue to produce.

The last Canadian Natural operated gas well which Nexen requests be shut in is the 13-27-84-6W4 well. The Wabiskaw C gas pool in this well has been mapped as a single well pool in the RGS. This pool overlies the Newby Wabiskaw McMurray G Pool. The G pool was examined in the interim hearings in 2004, and the Board ruled it should be allowed to produce. Nexen has not challenged this ruling in this hearing. Canadian Natural is puzzled by the request for shut-in of the Wabiskaw C interval, as even if there were to be communication to the underlying McMurray, that zone is allowed to produce. In this case, there appears to be no reason to change the production status of this zone regardless of the sealing capability of the Wabiskaw D shale.

Similarly, the SSG seeks the shut-in of pools on the general principle that the Wabiskaw D shale is not a seal, even where the evidence from the pool does not support such a conclusion. Like Nexen, the SSG requests the shut-in of the Newby Wabiskaw T pool, despite the fact that there is no new evidence from this pool to support the change in production status. Canadian Natural believes this provides no basis on which the Board could reasonably reverse its ruling from the interim hearing. As presented in its submissions to this hearing, when the data is evaluated on a pool-by-pool basis, the evidence from the Wabiskaw D shale does not support the changes in status requested by the SSG.

In summary, the evidence submitted by Nexen and the SSG falls far short of supporting the sweeping dismissal of the Wabiskaw D shale as a sealing unit. Nor does their evidence when examined on a pool-by-pool basis, support the changes in production status they request. The production status of the wells in issue should not be changed in the absence of new evidence to support such a change.

Some comments on potentially recoverable bitumen. In the current hearing, disagreements concerning the definition of "potentially recoverable bitumen" are the core issue for the Wabiskaw B valley fill gas pools at Kirby. The issue centres around whether the criteria set out in ID-99-1 are appropriate for the Wabiskaw B valley fill, or if the nature of the unit is such that those criteria should be changed.

The purpose of defining potentially recoverable bitumen is to set a consistent benchmark against which bitumen can be evaluated to determine if it is, in fact, potentially recoverable and requires special protection. From the beginning, the Board has recognized that not all units are the same and that the particular characteristics of a reservoir impact the potential for bitumen deposits to be economically viable. This recognition is demonstrated in ID-99-1 which contains not only the 10m/50 percent saturation cutoff, but also different cutoffs for the Clearwater, Wabamun, Nisku and Grossmont formations. Subsequent revisions of ID-99-1 continue to set different cutoffs for different formations. In summary, the concept that economic bitumen cutoffs should vary to reflect geologic differences is well established.

ID-99-1 initially considered the Wabiskaw/McMurray to be sufficiently similar that the 10m/50 percent saturation cutoff was applied to both. In the interim hearing of 2004 the SSG, when examining the pools in the Tar-Ells area, recognized that the Wabiskaw in the Northern study area was different from typical McMurray reservoirs. After concluding the resource was inferior to the McMurray, the SSG advocated that the 10 metre cutoff not be strictly applied, and instead the use of an average of 15 metres over the area of influence be used. After examining the evidence, the Board in Decision 2004-045 states that:

> "The Board accepts that the potential for the development of commercial projects may be reduced in this type of reservoir. For the purposes of this decision, the Board agrees that gas production should be allowed in Ells and Tar where the average thickness of Wabiskaw bitumen pay is less than 15 metres and a regionally correlatable mudstone separates the Wabiskaw from the underlying McMurray." (Pg 6).

Canadian Natural and ISH both submit that the Wabiskaw B valley fill at Kirby is similar to that at Tar-Ells, where the nature of the unit is such that potential for development is so reduced that different cutoffs should be applied. In Decision 2004-045, the Board ruled that the 10m/50 percent cutoff should be applied to the Wabiskaw at Kirby because:

> "Wabiskaw sands in southern portions of the study area (Kirby Field) may be valley fill in nature and are thus more similar to the McMurray in their depositional setting. The Board therefore concludes that the same 10-metre thickness cutoff used for the McMurray should be applied to the Wabiskaw in the Kirby Field."

The data provided by both ISH and Canadian Natural show that while the Wabiskaw B at Kirby might have been deposited in an incised valley, the similarities to the McMurray end there. Canadian Natural has presented evidence which demonstrates the depositional differences between the McMurray and the Wabiskaw. Canadian Natural has also presented the petrological analysis carried out by AOSTRA that further highlights the differences in the two formations. Similarly, ISH shows that the Wabiskaw B, in stark contrast to the fluvial estuarine McMurray, is deposited in a fully marine environment. This lack of similarity between the two reservoirs demonstrates that these formations were not deposited in a similar setting to the McMurray and, as a result, has fundamentally different geologic characteristics from the McMurray.

Having demonstrated these differences, the next question is whether the characteristics of the unit are such that they will reduce the potential for commercial development. If the individual characteristics of the Wabiskaw B resource, such as permeability or saturation, are examined, they are clearly detrimental to SAGD performance. Canadian Natural has demonstrated, through empirical calculations, that the reduced saturation and permeability will reduce the expected performance of SAGD in a reservoir by more than 50 percent. When this is combined with the Wabiskaw B's coarsening up pattern and cemented intervals, the case for the reduction in the potential for commercial development is also clearly proven.

In the course of this hearing, the SSG has submitted that although the Wabiskaw B valley fill is different from the McMurray, it is similar to the Clearwate where SAGD has been undertaken. The SSG uses that analogy to support its argument that the cutoffs need not be changed. As stated by Canadian Natural's panel, the company's experience in operating SAGD pilots in the Clearwater is that the performance in this zone is 50 percent that observed in McMurray SAGD projects. More importantly, this performance is from only the best reservoirs in the Clearwater. As pointed out by Dr. Jiang, these Clearwater reservoirs are substantially richer and more permeable than the Wabiskaw B valley fill at Kirby. These facts also substantiate the assertion that the potential for commercial development of the Wabiskaw B valley fill is reduced relative to the McMurray and the Clearwater.

Canadian Natural believes that the fact that the Wabiskaw B valley fill differs from the McMurray is borne out by the evidence presented. Canadian Natural also believes that the evidence clearly demonstrates that these differences will detrimentally impact the SAGD process by more than 50 percent. Based on these findings, Canadian Natural concludes that the Wabiskaw B valley fill at Kirby is analogous to the Wabiskaw at Tar-Ells where the reservoir is different from the McMurray, and these differences will significantly impede a SAGD development. Accordingly, Canadian Natural submits that the cutoff at Kirby must be changed, as was the cutoff at Tar-Ells.

The question then becomes what value should be selected for the cutoff? Canadian Natural has shown that 20 metres of Wabiskaw B valley fill would be expected to provide

SAGD performance similar to that of 10 metres of McMurray. It is this observation that forms the basis for Canadian Natural's recommended cutoff. The application of this cutoff will leave all the Kirby Wabiskaw B Pools in dispute below the cutoff. Just as importantly to conservation, it would leave the large Kirby Upper Mannville I pool shut in. This is important as this pool overlies the bulk of the Wabiskaw B valley fill, including the thickest and richest portions which might someday be economic to develop.

In a practical sense, Canadian Natural notes that if the average 15 metre cutoff from the Tar-Ells area were applied to the Wabiskaw B valley fill, all of the pools in dispute continue to fall below the cutoff. In essence, there is no real difference between these two cutoffs.

Canadian Natural has raised concerns about the accuracy of the Bitumen assessment in the RGS. Again, this is only an issue if either of the previously discussed cutoffs is rejected and a lower cutoff applied. Canadian Natural continues to maintain that the RGS bitumen pay assessment is overstated. If, as the RGS has done, a weight Tar cutoff is used, the porosity value chosen should reflect the actual average porosity of the unit. In this instance, the cutoff should reflect the 34 percent core, or 31 percent log porosity observed, not the 27 percent used in the RGS. To do otherwise results in a pay overstatement.

In summary, the Kirby Wabiskaw B valley fill is clearly a poorer resource than the McMurray. Past practice of this Board, and the logic employed dictates that the cutoff criteria for this unit should be changed. Canadian Natural believes the data shows a cutoff of 20 metres will provide protection to the Bitumen equivalent to the 10 metre cutoff currently applied to the McMurray.

If the Board applies either the 20 metre cutoff proposed by Canadian Natural, or the average 15 metre cutoff applied to Tar-Ells, the Wabiskaw B valley fill beneath the Kirby Upper Mannville J, U2U and V2V would not contain potentially recoverable bitumen. Thus, none of the Wabiskaw B valley fill is associated with potentially recoverable bitumen under case 4 in the RGS. In this circumstance, the production status of the Wabiskaw B valley fill will be controlled by the determination of association with bitumen in the McMurray, under case 3 of the RGS.

In the following discussion concerning the individual pools found in the Wabiskaw B valley fill at Kirby, the pooling used is that put forward by Canadian Natural in its May 9th response, and is illustrated in Figure 2 of that submission. As described in that submission, the pooling illustrated for the Kirby Upper Mannville J, U2U, V2V and B4B pools best fits all the available pressure and fluid contact data.

The Kirby Upper Mannville J pool is the simplest of the pools to examine. All parties have concluded that 11-25-73-8W4 should be removed from the pool based on fluid contacts. Having done this, the pool is entirely underlain by regional McMurray muds. As such, the pool is not in communication with potentially recoverable bitumen in the McMurray, and should be allowed to produce.

The Kirby Upper Mannville U2U pool is a somewhat more complex pool to assess. This pool is largely, but not entirely underlain by these regional McMurray seals. The RGS indicated that gaps in these regional seals were seen in 9-34-73-8W4. Canadian Natural has demonstrated that the core from this well did not recover the interval in question.

We have also demonstrated through correlation, that the depositional pattern in this well exactly mimics that of the offsetting wells, with the McMurray A mudstone preserved immediately below the Wabiskaw D valley fill.

The alternative put forward by the SSG is based on a single fragment of core recovered from an interval where several metres of core were lost, and a depositional model that requires an unlikely series of coincidence to recreate the regional depositional pattern observed. Based on this, Canadian Natural concludes the seal is present in this well.

Similarly, in its May 9th submission, Canadian

Natural demonstrated through correlation that the recorded absence of the regional McMurray mudstone in 7-36-73-9W4 was also an error.

The final problematic wells in the U2U pool are those located in sections 5 and 6-74-8W4. At these locations, Canadian Natural relies on three features to show isolation of the Wabiskaw B valley fill from potentially recoverable bitumen.

Firstly, Canadian Natural observes a lack of bitumen in the McMurray at these locations. Although the Board has stated that accommodation space must be considered, it has also stated that geology must also be considered. Canadian Natural observes from the RGS Bitumen evaluation map that a linear thick trends east to west across the northern edge of township 73-8W4, and then tracks southeast across 73-7W4. Logs along this trend show the anomaly to be related to a thick McMurray channel deposit that rests on the Devonian, in the lower portion of the McMurray.

Canadian Natural also observes that the channel sand from this system is also present in sections 5 and 6-74-8W4, but in this area, the sand is below the bitumen/water contact. Since the main bitumen reservoir in the township is located in the lower McMurray, Canadian Natural submits that there is little likelihood of thick bitumen appearing in the accommodation space at the top of the McMurray. Accordingly, Canadian Natural believes that the accommodation space should carry little weight.

Secondarily, Canadian Natural submits that the muddy base of the Wabiskaw C sand also acts as a seal in this area. In its May 9th submission, Canadian Natural has shown the sealing ability of this unit by the presence of top gas and top water trapped below the muddy basal Wabiskaw C in both 9 and 10-34-73-8W4. This is further supported by ISH's evidence from the vicinity of the Kirby Upper Mannville II pool where similar sealing is noted.

Thirdly, Canadian Natural believes that the generally observed cement streaks are sufficiently laterally continuous that they will act as barriers to the vertical growth of a SAGD chamber such that the chamber will be prevented from contacting the Wabiskaw gas. Based on this, Canadian Natural believes these cemented zones are likely to act as local seals as well.

Since the locations where the regional McMurray seals are absent are unlikely to have potentially recoverable bitumen that any bitumen encountered would be isolated below a demonstrated Wabiskaw C seal, and there is a high potential for Wabiskaw B valley fill cemented zones to act as a further barrier, Canadian Natural contends that there is no risk to potentially recoverable bitumen in the McMurray.

Again, Canadian Natural believes that when all relevant factors are considered, as required by ID 99-1, production from the U2U pool does not put at risk potentially recoverable bitumen, and this pool should be allowed to produce.

Similarly, the Kirby Upper Mannville V2V pool is entirely underlain by the Wabiskaw C, with the exception of 10-01-74-8W4, where the regional McMurray acts as the seal. The Wabiskaw C unit averages 2 metres of thickness and has been demonstrated by ISH to be a sealing unit.

ISH also notes that a single cemented horizon is continuous throughout the pool and serves to further isolate the gas. These barriers effectively isolate this pool from the Wabiskaw D valley fill, and the underlying McMurray.

In addition, every well in the pool is isolated from McMurray bitumen by regional McMurray shales with the single exception of 10-13-74-8W4. Canadian Natural believes that these multiple-stacked seals, combined with the poor reservoir quality of the basal Wabiskaw B valley fill preclude any potential for a SAGD chamber operated in any underlying zone contacting the Kirby Upper Mannville V2V pool.

Again, Canadian Natural submits that a rational examination of the available data will not find this pool in association with potentially recoverable bitumen.

Canadian Natural agrees with ISH that the Kirby Upper Mannville II Pool should be allowed to produce. This pool is contained within a thin, very poor quality Wabiskaw B valley fill reservoir. It is entirely underlain by the muddy Wabiskaw C sand unit, which ISH has demonstrated acts as a seal in the immediately offsetting wells.

Further, three of the four wells are isolated by the regional McMurray mudstones. Again, a reasoned evaluation of the data does not support the shut in of this pool.

The SSG has requested the shut in of the Kirby Upper Mannville O30 Pool. Its stated reason for this request is that it does not agree with the findings of the Board in the Interim Hearing. It provides no new evidence to support its contention that the Board made an error. It simply suggests that the Board should change its mind. The Board must reject this request for an arbitrary reversal, and confirm the previous ruling which was based on an examination of all the available data.

Similarly, the SSG seeks to reverse the findings of the Board concerning the 3-21-74-7W4 well. As in the Interim Hearing, it concludes that the static pressure recorded in February 1994 was depleted, and then concludes that the depletion must be from the Kirby Upper Mannville I

Pool. This logic, however, is faulty because the first conclusion is incorrect.

The pressure recorded is not depleted. It falls within the range of recorded virgin pressures in the area. It is significantly higher than the pressures recorded in the Upper Mannville I Pool at that time. It is higher than the nearby 11-33-74-7W4 well which Mr. Schuldhaus, on pg. 264 of the transcript, described as not having been drained. In short, there is no reason to conclude 3-21-74-7W4 is depleted, and therefore no reason to connect it to the I pool.

After examining all the data at the interim hearing, the Board found 3-21-74-7W4 to be a single well pool, not connected to the Kirby Upper Mannville I pool. No compelling evidence has been presented that demonstrates this ruling was in error. With no new evidence, the Board should again confirm the interim decision, and allow this well to produce.

Now, Mr. Chairman, some comments on Hardy Wabiskaw McMurray A Pool. CNRL's position throughout has been that all available data must be considered in determining the vertical and lateral isolation of gas pools and of gas pools and bitumen zones. CNRL has also consistently maintained that all available data must be examined on a pool-by-pool basis and not on any area, field or general basis.

Accordingly, CNRL views the methodology used by Paramount to determine vertical and lateral isolation within the Hardy Wabiskaw-McMurray A Pool as reasonable, if not rigorous. Use of the various techniques employed with all of the available geological, geophysical and engineering data clearly proved that the Hardy Wabiskaw-McMurray A Pool is not a large single pool. Rather, there are several smaller pools with definite boundaries.

CNRL submits that the 25 separate pools defined is a reasonable conclusion. The fact that there are some limitations, discontinuities, inconsistencies, and possibly errors in the quality and quantity of geologic and engineering data available is not unexpected. In CNRL's view, the integration of proven techniques and professional experience was successful in interpreting the data. The degree of success ranged from definitive to possible; despite flaws in the data.

CNRL is of the view that many of the large pools in the Athabasca Oil Sands Area as currently defined are similarly complex and should be analyzed in this integrated manner to better define vertical and horizontal isolation.

Some comments on pressure monitoring, Mr. Chairman. Canadian Natural is aware of the recommendations by the SSG and Petro-Canada. Canadian Natural supports the idea of a pressure monitoring program but the extent of that program needs to be determined having regard to the costs involved. Several issues have been identified that have not been resolved in these proceedings.

Wellbore configurations involving packers and bridge plugs will contribute to operational problems and added costs. Producing up-hole non-associated gas zones above a suspended zone needing a pressure measurement will be at risk to damage and loss. Abandonment of zones should be done with bridge plugs and not cement squeezing of perforations. There may be technical or economic value to access zones in the future. Cement squeezes have historically failed pressure tests at a rate of 25 times the failure rate of bridge plugs. Cement squeezes have a high chance of being costly and should be executed only in special circumstances.

Wellbore ownership issues include: Close to all the available wellbores required for pressure monitoring are owned by the petroleum and natural gas rights owners and not the oil sands rights owners. With hundreds of wellbores in hundreds of gas pools, an effective and efficient way of using these wellbores needs to be thoroughly evaluated by the Board and by industry.

Cost issues include: A large scope pressure monitoring program as suggested will cost tens of millions but is more likely to cost hundreds of millions of dollars in wellsite access, equipment, installation, lost production, data gathering, engineering and reporting.

The suggested installation of one-half million dollar permanent downhole gauges at one every five sections in the 5000 square mile RGS area equates to one-half billion dollars. The risks to production and reserves of uphole-producing zones could add significant costs to a program. Guidelines need to be developed to address cost sharing and compensation for wellbore utilization.

Canadian Natural recommends a committee-type process with the Board and industry outside of these proceedings to address known issues and possible new issues. The importance and impact of these issues with a large scale pressure monitoring program need to be evaluated and solutions need to be jointly agreed to. The Board at this time has not identified or evaluated all the issues and potential problems. Implementation of a directive based on these proceedings would be a mistake.

Canadian Natural recommends a pressure monitoring program that meets the needs of and is equitable to all parties. The objectives of a pressure monitoring program need to be clearly defined. The resulting outcomes from the potentially massive and costly collection of pressure data need to be clearly defined.

Some comments on the use of reservoir modeling in determining the effect of associated gas production on SAGD bitumen recovery. This topic has been of great interest not only to gas or bitumen producers but also to the academic world. In CNRL's opinion, the presence of any top gas will reduce the efficiency of a SAGD operation after the steam chamber comes into contact with the top gas no matter what the pressure is in the gas zone.

While a drop in the pressure of the gas zone beyond some point by gas production may increase risk for SAGD bitumen recovery, the degree of the impact of the reduction in top gas pressure on SAGD performance is related to many factors such as the size of the top gas in relation to the size of the SAGD operation area; thickness of SAGD pay; thickness and extension of the top gas; the quality of the reservoir; particularly, the quality of the reservoir near the top gas; in particular, whether there are any barriers or baffles below the top gas; initial bitumen viscosity, whether the bitumen is mobile at initial reservoir temperature; SAGD well spacing, operating strategies and pressures, et cetera.

It is difficult to reach and apply general conclusions on this subject due to the differences between pools. The proper approach, in CNRL's view, is to study the effect of gas production on SAGD bitumen recovery at each specific site. Obtaining and considering the unique features and geology of each reservoir is the key to understanding the potential risks of associated gas production on SAGD bitumen recovery. Because there is no field data currently available to demonstrate the interaction of a gas cap with a SAGD chamber, laboratory testing and reservoir modeling are the only alternatives available for this type of analysis.

The difficulty in scaling reservoir heterogeneities and the size of the pool in the model means that laboratory testing will have limited application. Reservoir modeling, on the other hand, can take the reservoir heterogeneity, such as the parameters generated from a geostatistical model and fluid properties into consideration. With a proper history match with gas production and a sensitivity analysis of the key parameters on SAGD operations, the results from reservoir modeling can provide both a qualitative and a quantitative assessment of the effect of associated gas production on potential bitumen recovery.

Accordingly, in CNRL's opinion, the results from the reservoir modeling provide useful evidence that should be considered by this Board.

Some comments on the need for ID 99-1 applications for uncompleted wells. CNRL sees no reason to require an ID 99-1 application for wells where the Board has already examined the available data and rendered a decision allowing an interval to be produced, even though currently not completed.

If at the time of completion there is no new information, an ID 99-1 application simply wastes the time and resources of both the Board and the Applicant to re-examine material that has already been examined.

If there is new information that supports the production status of an interval, again an ID 99-1 application serves no purpose as it would simply confirm the previous finding.

If there is new information that suggests that the production status of a zone should be changed, the Board has the ability to review the production status of that zone at any time, regardless of the completion status. Accordingly, CNRL does not support a requirement for an ID 99-1 application for completion of wells into zones where the Board has already determined production status.

That is the argument of Canadian Natural,
14:56 Mr. Chairman, subject to any questions you may have.

THE CHAIR: We don't have any questions, Mr. McGovern. Thank you.

MR. McGOVERN: Thank you, sir.

THE CHAIR: Mr. Mooney, we'd like to take a break before we get to your argument. We'll take 20 minutes.

(ADJOURNMENT)

THE CHAIR: Thank you. Please be seated. Would you like to proceed, Mr. Mooney?

MR. MOONEY: I had understood from speaking with Mr. Perkins that perhaps we were to address the issue of when we were starting tomorrow.

THE CHAIR: He just spoke to me about that five seconds ago and I've already forgotten. Yes, we'd like to start at 8:30 in the morning, and I understand

15:21

arrangements are being made to contact those who have already left. Thank you, sir.

MR. MOONEY: Good afternoon, Mr. Chairman, members of the Board and Board Staff. I am pleased to provide the final argument of ISH Energy Ltd. I have shared copies of my argument with the court reporter as a courtesy.

In its previous filings in this proceeding, as well as in its direct evidence, ISH has specifically responded to the SSG's concerns about certain pools, as well as detailing the general issues that should be considered by

15:21

this Board in its final decision of whether gas production from these pools should be allowed to continue.

For the record, the specific pools in respect of which ISH has a producing interest in this proceeding are the Kirby Upper Mannville O3O pool; the Kirby Upper Mannville

J pool; the Kirby Upper Mannville II pool, the Kirby Upper Mannville U2U pool; and finally the Kirby Upper Mannville V2V pool.

Before beginning a discussion of the general issues and how they affect the final determination for each of these pools, it is instructive to first consider the purpose of this proceeding; that is, the last step in the protection of potentially recoverable bitumen where it is associated with gas. This purpose was clearly set out in the Board's General Bulletin 2003-28 that established this
15:22
process.

It has been a long and somewhat difficult road to get to this final hearing. Previous proceedings, including the interim proceedings, have addressed the objectives and the criteria established by the Board, and the areas of most obvious concern appear to have been resolved either by the Board's shut-in order or by a conscious decision to allow gas to be produced. I want to make sure that ISH's purpose in this proceedings is not to challenge or to revisit any of the objectives or broad criteria set by the
15:23
Board in making those decisions. Rather, what ISH is asking the Board to consider here are some grey areas; essentially, the unique circumstances where the applications of broad criteria seem to produce results inconsistent with the overall objective of the Board in establishing the bitumen

conservation requirement.

The Board noted in GB 2003-28 that its challenge is one of managing risk in a fair and responsible way until such time as uncertainties can be reduced or eliminated. The Board concluded that,

> "associated gas production presents an unacceptable risk to bitumen recovery using steam-assisted gravity drainage."

Due to its sense of urgency, the Board proceeded through the interim proceeding limiting its assessment strictly to the

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question of whether gas is associated with potentially recoverable bitumen. For the purposes of that proceeding, the Board's guidance was substantially directed by the definition of an arbitrary cutoff and criteria as to what was thought might constitute potentially recoverable bitumen.

ISH hopes it has presented persuasive evidence in this proceeding that those criteria do not, in these grey areas, always lead to sensible results. Specifically, where bitumen thickness is minimal and its quality is demonstrably poorer, compounded by the presence of multiple barriers that

15:24

isolate the gas from the bitumen, as the evidence shows is the case for a number of pools in the western portion of the Kirby field. It is in these greyer areas where ISH urges the Board not to blindly apply criteria that were developed for the black-and-white requirements imposed for the purposes of the interim hearing, but rather for the Board to exercise a reasonable discretion to make allowances for what are some obvious distinctions in respect of factors that will have a material impact on the determination of whether gas is associated or whether the bitumen is potentially recoverable using SAGD technology.

In advancing its position, ISH is not asking the Board to depart from its previous views. In fact, ISH's argument accords with the Board's reasoning in Decision 2004-45 in which it accepted that the potential for the

15:25

development of commercial projects may be reduced in the reservoir found in the Ells and Tar fields. And in light of this diminished potential for bitumen recovery using SAGD technology, the Board concluded that a somewhat higher bitumen cutoff of 15 metres for those fields was reasonable. That is the reasoned and sensible approach that ISH submits is also appropriate in the present circumstances.

As I indicated, ISH is not challenging fundamental principles or that overriding conservation rationale that has brought this matter before the Board. The

15:26

Board has established the rules in this regard. Rather, ISH is trying to work with the Board to ensure that while potentially recoverable bitumen is protected, that this proceeding is not reduced to an exercise in shutting in gas production irrespective of the bitumen.

To this end, the determination of whether wells in these pools should be allowed to continue to produce should not be a product of the application of inflexible criteria but should be the result of a thorough consideration on a pool-by-pool basis of all of the relevant evidence. After evaluating the evidence and adjusting for material circumstances that will significantly impact on the recoverability of bitumen using SAGD technology, the Board should establish overall criteria that will meet the most strident definition of realistically recoverable bitumen.

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ISH's submissions attempted to illustrate to the Board that, when all the evidence is properly weighed, the continued production of gas by ISH from these pools will not result in any material risk to potentially recoverable bitumen in the Kirby area.

As stated previously by ISH, there are generally two distinguishing features that should be considered in terms of Wabiskaw gas production in the western portion of the Kirby field: First is the inferior quality of the Wabiskaw B bitumen in the Kirby field including its

15:27

general thinness; and, second, the presence of intervals other than regional mudstones such as the McMurray A and B mudstones that isolate the gas pool in question from the underlying bitumen.

With respect to the issue of bitumen quality, not only does the RGS show the Wabiskaw bitumen as uniformly thinning in this area, but also that this thinner bitumen horizon is of a significantly poorer quality in terms of its suitability for steam-assisted bitumen recovery operations. The poor quality of the bitumen in the Kirby field is a product of both the pervasive distribution of clays within the bitumen zones and the multiple areally extensive calcite cemented horizons within the thinner Wabiskaw B bitumen deposits. Both ISH and CNRL have concluded that as a consequence of the Wabiskaw B bitumen's inferior quality and

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thinness in the western portion of the Kirby field, it is not realistically amenable to recovery using SAGD technology.

It is ISH's view that the potential recovery of Wabiskaw B bitumen is fundamental to the ultimate purpose of this proceeding. The Board made it clear in the context of the interim hearing that in the interest of expediency for the purposes of that proceeding the Board was prepared to consider only whether bitumen was associated with gas. In the name of expediency, the Board was prepared make protective decisions on the basis of very general criteria;

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the black and the white. However, the intent of the current proceeding is not similarly constrained, and thus the realistic recoverability of the bitumen is not only material but also, in our view, a fundamental component of the Board's analysis and final determination of whether to allow gas production to continue.

It is fundamental to this issue, because if the bitumen is of such a poor quality in this reservoir that the realistic potential for meaningful development disappears, then, for all intents and purposes, the bitumen does not require protection. To mechanically apply criteria that were developed with respect to deposits where the bitumen has a real potential for development due to its increased thickness and significantly better quality would unreasonably fetter this Board's discretionary power, while

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ignoring an obviously important consideration that clearly impacts bitumen recoverability.

This factor is precisely that which the Board recognized and adopted with respect to the Tar and Ells area. Accordingly, the poor quality of this bitumen, particularly in the context of its relative thinness, is an issue that must be considered in the determination of whether gas from these pools can continue to be produced.

Because of the importance of this consideration, that is, the potential recoverability of the

15:30

bitumen, ISH believes that the comparative information set out in Exhibit F-10 is significant to this proceeding. Although, as was speculated, this comparison may reflect operational issues that neither ISH nor the Board are aware of, we do know the comparison is a function of the substantial differences in reservoir character, thickness and quality that we have identified. And bear in mind that the failed cyclic steam pilot projects in the best and thickest part of the Kirby field's bitumen were operated by EnCana's predecessor, AEC, and Petro-Canada, parties that have considerable expertise in relation to bitumen production and overcoming operational issues.

In fact, the most damning evidence in this proceeding that the tight intervals and clay content in the Wabiskaw bitumen are of significant consequence was not

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presented directly by ISH or by any other party. Instead, it is a pragmatic evaluation. Consider that despite the record-high oil prices that the industry is in the throes of, there are no pilot projects or expressed interest in this area. The recovery of the bitumen will require technology other than SAGD, but the issue in this proceeding is uniquely a SAGD issue.

In fact, the owners of the bitumen rights in this field have not objected to continued gas production by ISH. In this proceeding, ISH is addressing concerns that are

15:31

premised on general criteria that do not take into account the specific characteristics of the bitumen reservoir at issue. In fact, there has been no evidence presented of the realistic opportunity to overcome the specific operational difficulties, if not outright barriers, presented by the parameters of the Kirby Wabiskaw reservoir.

The Cold Lake Clearwater bitumen was presented as an example of bitumen that was being recovered despite containing clays. The ISH evidence has indisputably distinguished the Cold Lake Clearwater bitumen from the bitumen in the western portion of the Kirby area on a number of bases, including the significantly greater thickness of Clearwater bitumen deposit, the amenability of Clearwater bitumen to other recovery techniques, the significantly greater clay content and different clay composition that 15:32 substantially reduces the porosity in the Kirby field, and permeability that is four to five times lower in the Kirby Wabiskaw.

Having regard for the significant differences in reservoir quality, it is clear that the successive SAGD and cyclic steam recovery schemes in the Cold Lake Clearwater should not be accepted as evidence that SAGD will succeed in the Kirby Wabiskaw, particularly the western portion thereof.

With respect to the easy-to-make suggestion that anything is possible or we just don't know for certain, 15:33 the evidence is quite compelling that the quality of bitumen found in the western portion of the Kirby field coupled with its actual thickness is not realistically capable of economic recovery using SAGD technology.

The evidence provided by ISH and CNRL spells out the obvious reasons that the thinner bitumen, meaning less than 20 metres, or in any event, less than 15 metres, in the western portion of the Kirby Wabiskaw, will not be capable of economic recovery using SAGD.

Exhibit F-10 compared the productivities of projects initiated in the Clearwater and in the Wabiskaw deposits and clearly demonstrates that the poor quality of the bitumen in the Kirby field will result in not as much of the bitumen being recovered, a lower rate at which it can be extracted, and necessarily higher operating costs.

15:33

A bitumen cutoff that takes into account the quality of bitumen, eliminates the concern of producing gas in communication with potentially recoverable bitumen which, after all, is the intended purpose of this proceeding.

With respect to the thickness of the bitumen deposit in the western portion of the Kirby field, the substantial field drilling in this area has not shown that there is any actual potential for thick bitumen, particularly in ISH's gas production area. This is wholly consistent with the RGS study of bitumen in this area which did not map the

15:34

presence of thick bitumen in the western portion of the Kirby field.

As stated before, in Decision 2004-45, the Board assessed the Ells and Tar fields as having a reduced potential for commercial development and consequently raised the bitumen thickness cutoff to 15 metres. By doing so, the Board clarified that potentially recoverable was not just equal to or greater than 10 metres of bitumen. When compared to the bitumen found in the Kirby field, the Ells and Tar fields' bitumen clearly constitutes a better quality reservoir. But this Board has been urged to apply a 10-metre cutoff without an appreciation of the potential for realistic development of the field in question.

While applying this cutoff may be reasonable for the areas where bitumen quality is markedly greater, it
15:35
certainly would not be reasonable for the significantly poorer bitumen found in the Kirby field.

The determination for Tar and Ells was based on an assessment of the potential recoverability of the reservoirs in question. For essentially the same reasons the bitumen cutoff values with respect to Wabiskaw bitumen in the western portion of the Kirby area should also be increased to at least 15, or more appropriately, 20 metres.

With respect to the presence of seals that are not, geologically speaking, regional in size, you have heard
15:35
the ISH witnesses state their conclusions that in some specific pools in the Kirby field these intervals are large enough to cover the gas pool and its region of influence. Evidence supporting this conclusion included gas located under these sealing zones which simply does not happen if

these are discontinuous concretions and not seals.

ISH remains of the view that there are a number of areally extensive intervals in the Kirby field that have demonstrated the capability to isolate McMurray bitumen from Wabiskaw gas production. These were identified in evidence as the basal section of the Wabiskaw B, the tight calcite cemented layers within the Wabiskaw B, and the Wabiskaw C-type layer.

Of significance to ISH's conclusion that gas production from these pools will not affect the ultimate
15:36 recoverability of the underlying bitumen, is the evidence that these intervals are in addition to the McMurray A and B regional mudstones that underlie many of the wells in the gas pools that ISH is producing from.

For the McMurray bitumen to be effectively isolated and thereby protected, ISH's witnesses concluded that only one of these intervals would have to be presence over a gas pool's region of influence, if that interval provides an effective seal over the extent of that region of influence.

15:37 Consequently, in many of these pools, we don't just have a belt-and-suspenders situation but a number of each of these in place. That together should repeatedly reassure this Board that gas production is isolated from the McMurray channel bitumen.

It is acknowledged that these tight intervals are consistently found in the relevant cores. However, it has been theorized that the Wabiskaw B and C should not be accepted as constituting an effective seal in this area even though 95 percent of the Wabiskaw B valley fill cores examined were found to have these tight-cemented intervals.

Further, the multitude of cemented horizons observed in both logs and cores in this area have been dismissed as discontinuous concretions that do not isolate the underlying bitumen even though 109 out of the 115 cores

15:38

have these bolder-sized concretions. The position that these tight intervals are discontinuous and therefore do not create an effective seal must be gauged with this evidence in hand.

Of more significance though, is that the effectiveness of these "local" seals, local in quotation marks, has been demonstrated to exist over specific pool's region of influence. It is therefore reasonable to acknowledge that these are areally extensive and nonpermeable intervals that effectively isolate Wabiskaw gas production in the ISH pools at issue from the underlying McMurray channel

15:38

bitumen.

ISH submits that the localized seals present in the Kirby field are effective in isolating the gas being produced from underlying McMurray channel bitumen and as a consequence, Wabiskaw gas production from these pools will not present a risk to the potential recovery of the McMurray bitumen.

Now that we have summarized the general arguments, we can discuss the implications of each for the specific pools of concern for ISH.

With the upper Mannville O3O pool, the SSG as exemplified the very subjective nature of issues before the Board. The very greyness that I touched on earlier. You will recall that it had been acknowledged by the SSG in previous proceedings that it was a possible interpretation
15:39
that the McMurray A mudstone was present in all the wells in this pool. With this acknowledgment in hand, the Board allowed, presumably exercising its own reasonable judgment, gas production to continue from this pool. However, without any change in the evidence and still acknowledging the existence of the McMurray A mudstone as a possible interpretation, the SSG wants to reiterate its own previous interpretation that the Board has already rejected.

The technical review conducted for ISH clearly shows that the McMurray A regional mudstone is present in the
15:40
00-16-05-74-9 west of 4 well and all other wells in the upper Mannville O3O pool. In the absence of new compelling evidence, there is, in ISH's submission, no reasonable basis for the Board to now change its previous determination.

Moving on now to the upper Mannville II and

U2U pools. With respect to the effectiveness of the previously discussed intervals as seals, there is evidence that, in the case of the upper Mannville II and U2U pools, these zones can, in fact, be shown to be acting as an effective seal.

More specifically, in the upper Mannville II pool, gas and/or water underlying the Wabiskaw B bitumen in three wells, the 1-13-75-9, the 1-11-75-9 and the 14-18-75-8, all west of 4, conclusively demonstrate the effectiveness of the basal section of the Wabiskaw B and the tight Wabiskaw C 15:41 intervals as seals.

Although these wells are not in the II pool, they are all within two miles of it and both the Wabiskaw B and/or Wabiskaw C interval extends over the entire upper Mannville II pool's region of influence.

With respect to the upper Mannville U2U pool, not only do these areally extensive intervals also extend over its region of influence, but also a four-metre water zone in the well in the U2U pool, the well described as 3-5-74-8 west of 4, demonstrates a presence of an additional 15:41 isolating seal within the Wabiskaw D. It does so because an effective seal must be present in this well to separate the bottom water in the Wabiskaw D from the underlying McMurray bitumen.

If the applicable bitumen cutoff is increased, as we have argued it should be, so that it accommodates the inferiority of the Wabiskaw bitumen, then gas production should be allowed to continue in the U2U pool.

With respect to the upper Mannville V2V pool, regional McMurray mudstones are acknowledged to be present throughout it with the exception of one well, the 10-13-74-8 west of 4, however, even with that well in mind, it must be remembered that the Wabiskaw B and/or Wabiskaw C intervals are present throughout the upper Mannville V2V pool's region of influence.

15:42

Also, the Wabiskaw B cemented horizon 4 is continuously present throughout the region of influence of this pool. Together these zones provide at least three independent seals that effectively isolate the V2V pool from underlying bitumen. The effectiveness of horizon 4 as a seal is demonstrated by the gas trapped under this horizon in a well in the U2U pool, the 1-23-74-9 west of 4 well.

Under the circumstances, these local seals provide further assurances that gas production is not associated with potentially recoverable McMurray bitumen.

15:43

ISH's arguments in support of continued gas production from the V2V pool are predicated not only on the presence of multiple local seals but also thinner Wabiskaw bitumen deposits. With respect to the latter argument, if the cutoff is increased to reflect the inferiority of the

Wabiskaw bitumen, as I urged earlier, then gas production from this pool should be allowed to continue.

Finally, with respect to the upper Mannville J pool, the SSG recommend that this pool be shut-in on its alleged association with Wabiskaw bitumen greater than 10 metres in its eastern portion. However, the bitumen deposit within the J pool's region of influence is less than 15 metres thick. Therefore, if the Board accepts the general argument that, having regard for the inferior quality of the bitumen in the Kirby field, the corresponding cutoff should

15:44

be increased to at least 15 metres, or more appropriately, 20 metres, then there should be no reason not to allow gas production to continue from the J pool.

In conclusion, the evidence demonstrates that the Wabiskaw gas can be produced from the ISH pools in the Kirby field without realistically risking the potential recovery of bitumen using SAGD technology. The continued production of gas from these pools is, in the absence of conservation concerns, clearly in the public interest and is consistent with the efficient and orderly development of this

15:44

province's energy resources.

Accordingly, we respectfully submit that the Board allow continued production of gas from the wells in the Kirby upper Mannville O3O pool and also allow gas production from the wells in the Kirby upper Mannville II pool, the

Kirby upper Mannville J pool and the Kirby upper Mannville U2U pool and the Kirby upper Mannville V2V pool.

Subject to any questions the Board may have, those are ISH's submissions.

THE CHAIR: No questions from the Board, sir, thank you.

Mr. Perkins, I take it that what we need to do is simply resume at 8:30, there is nothing else we can do in the interim?

MR. PERKINS: Yes, sir, I think that's the

15:45

expectation.

THE CHAIR: Thank you, everyone. We'll see you at 8:30.

(Proceedings Adjourned at 3:50 p.m.)

PROCEEDINGS ADJOURNED TO AUGUST 12, 2005, AT 8:30 A.M.

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PROCEEDING NO. 1347905

ALBERTA ENERGY AND UTILITIES BOARD
PROCEEDING NO. 1347905: PHASE 3 PROCEEDINGS
UNDER BITUMEN CONSERVATION REQUIREMENTS
ATHABASCA WABISKAW-McMURRAY AREA

PROCEEDINGS

VOLUME 14
August 12, 2005
Govier Hall
Calgary, Alberta

Proceedings taken at Hearing, The Alberta Energy and Utilities Board, Govier Hall, 640 - 5th Ave. S.W. Calgary, Alberta.

Volume 14
August 12, 2005

J. Dilay, Esq.	Chair
C. Langlo, Ms.	Member
G. Williams, Dr.	Member
G. Perkins, Esq.	Board Counsel
G. Dilay, Esq.	Board Staff
K. Bieber, Ms.	Board Staff
E. Smith, Esq.	Board Staff
R. Happy, Esq.	Board Staff
C. Evans, Esq.	Board Staff
W. Corbett, QC	Petro-Canada
S. R. Miller, Esq.	
R. Kolber, Ms.	
R. Block, Esq.	Nexen Inc.
K. Johnston, Ms.	
P. McGovern, Esq.	Canadian Natural Resources Limited
A. McLarty, Esq.	ISH Energy Ltd. and BP Canada Energy Company
R. L. Mooney, Esq.	
L. Sali, QC	Paramount Energy Trust and Corporation
S. Munro, Esq.	
T. Mah, Ms.	
D. Rowbotham, Esq.	Stylus Energy Inc.
S. Munro, Esq.	Devon Canada Corporation

A. Reid, Esq. D. Castellino, Esq. D. Davies, Esq.	EnCana Corporation
M. Alexander, Ms. G. Bunio, Esq.	Paramount Resources
E. Kuemmel, CSR(A), RPR B. Ball, Ms. CSR(A), RPR, CRR	Court Reporters

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THE CHAIR: Thank you. Please be seated.

Good morning, everyone. If there is no housekeeping, we can move right into Mr. Sali's argument. Not seeing anyone coming forward, would you like to proceed, 08:34 Mr. Sali?

MR. SALI: Thank you, Mr. Chairman.

Mr. Chairman, Ms. Langlo, Dr. Williams, as I indicated yesterday, it is my intention to deliver but one argument, the closing submission together with whatever reply position that we wish to advance so as to make the process that much more streamline.

In addressing the issues present before the panel, it is Paramount's submission that the issues cannot be considered in isolation of ID 99-1 or the initiative of the 08:35 Board commencing with its comments in the Chard Leismer decision carrying forward into the three general bulletins in 2003 and the interim hearing conducted in early 2004.

Throughout we must also be mindful that the Board is a creature of statute, possessing only those powers conferred upon it by the legislation, correspondingly being obliged to honour, respect and follow any legislative promulgations and principles of common law affecting its jurisdiction and processes.

There may, for example, be circumstances where the desire of this panel to make a certain determination or to proceed in a particular manner is curbed by legislative or common-law constraints. That is one of the effects of having limited jurisdiction.

In section 12.2 of its decision in Chard 08:36 Leismer, the Board signaled its intention to address gas production in the Athabaska Wabiskaw McMurray deposit. General Bulletin 2003-12 issued in April of 2003 addressed the issue by inviting industry comments. In General Bulletin 2003-28, in July 2003, this Board concluded that within a defined area gas production that is associated with potentially recoverable bitumen must be identified and shut in as soon as possible. We are now in the final stage of the Phase 3 process.

Section 3.3 of General Bulletin 28 provided 08:37 that upon completion of the Regional Geological Study EUB staff would release their interpretations, addressing the key issue identified in General Bulletin 28. That recommendation did, in fact, occur with the SSG's report and recommendations dated January 26th, 2004.

In that recommendation consistent with Chairman McCrank's letter of December 17th, 2003, the SSG supported a process calling for an interim hearing with limited scope, namely whether gas is associated with potentially recoverable bitumen.

Of some significance, Mr. Chairman, is the following statement at page 2 of that recommendation, and I quote:

> "The SSG further submits that detailed evidence addressing such issues as the
> 08:36
> commercial bitumen criteria, technical solutions such as artificial repressuring of gas pools or artificial lift and reservoir modelling are not necessary at this stage of the proceeding, given the urgency of the bitumen conservation issue."

It will become apparent and indeed I submit is apparent that at no stage of the proceedings did the SSG address those issues.

08:38

The SSG in section 3.32 of its January 2004 submission also quoted an excerpt from General Bulletin 28 which is as follows:

> "The EUB considers potentially recoverable bitumen to be bitumen in

> oil sands that has a minimum thickness of 10 metres with a minimum bitumen saturation at 50 percent. Consideration must be given to the volume of the bitumen encountered, the geological depositional environment, the presence of associated water zones and the available well control."

Now, at the conclusion of Phase 3, we need to
look back to see which, if any, of the parties have addressed
08:39
the issues which need to have been addressed. We submit that the answer to that question is clear. Paramount and only Paramount. Even the SSG itself which this Board commissioned in 2003 to deal with the issues did not.

This panel is left with little or no alternative but to consider the issues presently before it as they relate to the Paramount gas by considering and relying upon the evidence tendered by Paramount.

Now, we need to also be mindful of the fact,
Mr. Chairman, of the processes which were put in place by the
08:40
Board in respect of this final hearing. I want to reference the Notice Of Hearing, and you will recall that as part of the final hearing phase submissions were to be filed in mid February 2005. Here is what the Notice Of Hearing also told us:

> "March 21st, 2005 was the last day for the parties to make information requests; April 11, 2005 was the last day for parties to respond to those information requests; May 9th, 2005 was the last day for parties to file a submission characterized as a response submission in response to a submission or declaration which had been filed on February 14th, 2005."

08:41

What does that all mean? It's simply this: The process which you put in place was one which said for the final hearing stage file your evidence and your submissions on February 14th, 2005; there will be an IR process; there will be a further period of time which really extends to approximately three months from the date of the initial submissions being filed in February 2005 in which there will be response submissions.

As you consider the issues before you, I invite you to consider the response submissions made by three
08:42
parties: The SSG, Petro-Canada and Nexen. Nexen did what it was expected to do, it responded to the submissions that had been earlier made that it took issue with.

I invite you to look at the submissions of the SSG and Petro-Canada that were filed in May 2005. For the most part, if not completely, silent, if not totally silent, as to any of the issues raised by Paramount, in particular the simulation and modelling.

You put in place a process which called for these responses. What we have now is silence until cross-examination and final argument. That's not what you intended, nor that should be the way the process should work.

I will now address the specific issues
identified by the panel as being matters of interest to it.
I will also refer to certain other issues which Paramount
08:43
considers to be important, both substantively and
procedurally.

First of all, the effect of gas production on SAGD recovery and performance. Remember, Mr. Chairman, this is a live and real issue. Paramount addressed it head on.

The important features of Paramount's work are
as follows: We have the modelling which is best described in
my submission as state of the art. It's the last modelling
that was presented was in the course of the Chard Leismer
proceedings. Paramount assembled a team of experts, largely
08:44
independent, to conduct integrated studies with expertise in
regional geology, sedimentology and stratigraphy of the
McMurray formation in the Athabaska region. Log analysis,
geo statistics, engineering, thermal simulation.

As a demonstration and a reminder of their impartiality, and I have more to say about that later, most of these people consult dominantly to bitumen producers. In five pools Paramount constructed detailed three-dimensional geostatistical geological models that preserved appropriate levels of heterogeneity suitable for making realistic forecasts of SAGD performance. No vertical barriers were allowed between underlying bitumen and overlying gas zones. The system was to be in communication.

The RGS was used for the modelling. No vertical seal was introduced into the simulation models. The

08:45

geological model put forward by Paramount was constructed using geostatistical methods which preserved the heterogeneity of the rocks being studied. The geological model was validated through history match of gas production. In comparison, previous simulation models presented during Chard did not incorporate realistic levels of heterogeneity. Within the flow simulation, geological description has a very strong control on performance. Preservation of heterogeneity leads to much more realistic predictions of steam chamber development and SAGD performance.

08:46

Hundreds of 2-D and 3-D numerical simulations were conducted that investigated SAGD performance and ultimate bitumen recovery at different overlying gas pool pressures. These simulations covered scenarios that included bottom water, top water, single gas pools, multiple gas pools and chimney wells that contained reservoir quality sands to the top of the McMurray.

Far more sophisticated and exhaustive modelling than had been presented or appears to have been presented in the past.

In addition to these 2-D simulation runs using the original geostatistical description, the geological model was modified by adding 25 to 30 metres of clean homogeneous high-quality reservoir in the base of the McMurray formation, replacing the geostatistical description. The 2-D simulation
08:47
runs were repeated at different overlying gas pool pressures.

Further, a 3-D model was constructed that contained a hypothetical, continuous, high-quality sandstone of constant properties was modelled.

Scenarios were run that included gas over bitumen and gas over water over bitumen.

The simulation runs were repeated at different overlying gas pool pressures. All simulations of both the realistic geology and the enhanced reservoir description show that SAGD performance and ultimate recovery is insensitive to
08:48
overlying gas pool pressure. The results show that SAGD performance is controlled dominantly by geological characteristics, not pressure.

The results from simulation studies are supported by data from existing SAGD projects. None of the operators of the bitumen leases under these pools challenged or even participated in the hearing: JACOS, Hangingstone McMurray X and KKK pools; Paramount Resources, Corner McMurray G pool; Imperial Oil, Corner McMurray C pool; and EnCana and MEG, Hardy Wabiskaw McMurray A pool.

Paramount's modelling demonstrate that any bitumen under the KKK, X, G and NNN pools is not exploitable. Some of the bitumen underlying the C pool is exploitable, but is covered by a thick and extensive top water zone as mapped by the RGS.

08:49 No party provided any meaningful evidence or for that matter, any evidence at all, contrary to these conclusions, so why should the Board rely upon Paramount's modelling results?

It is the most current work available and involves a more sophisticated approach; it provides more realistic results than studies provided to the Board in the past.

The results and conclusions have been validated by a review of data and observations provided from
08:49 current SAGD projects.

Other parties currently use this approach already. An example is Petro-Canada at its MacKay River commercial project, uses geostatistical analysis and flow simulation to assist in managing that project.

Ask yourself a basic question: If it's good enough for Petro-Canada in its commercial project, why is it not good enough for you in the discharge of your conservation mandate?

There were modelling criticisms leveled at Paramount which I will address later on, but we submit that nothing in the cross-examination undermined the essential credibility or the validity of its modelling results.

There were comments made about history matching. Some suggested that the pressure data was not
08:50
matched. Paramount showed that the data highlighted by certain parties was either wellhead data or data from other zones. Neither were as appropriate to match.

Comments were made about the geostatistical approach. Paramount showed that the geological description used by it has a strong influence on simulation results.

Paramount demonstrated that the Chard models incorporated no heterogeneity in the geological description and showed how the results changed when this homogeneous geology was modelled. The Chard models showed higher
08:51
recovery, lower SOR, more rapid and invasive steam chamber interaction with overlying gas zones, none of which are realistic.

Paramount demonstrated how the approach used by it was more appropriate, reflecting the actual properties of the geology within each pool studied, and leading to realistic forecasts of SAGD performance and steam chamber interaction with overlying gas zones.

Geology was then subsequently modified to include geology that was more favourable to the SAGD processes, although that geology was, for the most part, not confirmed to exist in these pools by the well log data.

There were comments made about water saturation. The changes that could be made to achieve the match included, as we know, increasing porosity, but this was
08:52
a very well-defined concern through the well logs.

One could increase thickness. Again, well-defined through well logs.

One could increase the area. This was defined by the RGS, and as you know, for modelling purposes, Paramount accepted the RGS.

Or one could modify the water saturation in the gas zone. This was not only the most logical but was predictable for the following reasons: No reliable core saturation data was available given that the gas escapes
08:53
during core handling, yielding more of a water test than gas saturation. This was confirmed by the SSG.

And gas cross-over in these zones caused the volume of the shale to read zero, so no correction to the resistivity measurement was made within the Simandoux equation. Dr. Ranger confirmed there is mud within the gas sands which would have resulted in a resistivity correction had the neutron density crossover not masked the shale volume.

Comments were made, the gas zone pressure continuity. Certain parties suggested that there was no pressure communication between the bitumen zone and the overlying gas zones.

Paramount demonstrated that in all cases pressure was communicating throughout the models. No
08:54 vertical barriers existed in these models consistent with the RGS model.

There were comments made that British rather than metric gas property information was entered by Paramount in the simulations. In fact, that is so. These models were rerun; the results were the same.

There was suggestions that Paramount didn't use the correct gas contact data. This data was not used by the model. Paramount reran the simulations modifying the datum with no change to results.

08:54 Results from different versions of software might yield different answers was the suggestion. Paramount confirmed that the modelling software version that was used provided accurate answers for the data sets and parameters that were input. The results are valid.

And again, as I said to you a few moments ago, I will have more specific reply toward the close of my submission.

I now want to move along to gas pooling and regions of influence.

The genesis of this issue is presumably ID 99-1, which, of course, makes sense inasmuch as it is the regulation which governs the process. It cannot be ignored nor circumvented.

The first issue is one of the delineation of 08:55 the gas pools; the second, the determination of whether there is top water. That is so because of the definition of a region of influence contained within ID 99-1. That definition has never been changed. It has the force of regulation and as such, it must govern.

I want to add, Mr. Chairman, members of the Board, that as I read ID 99-1 there's nothing at all within that regulation which even remotely contemplates what has been referred to as accommodation space. That may be for another day and another place in an amended regulation but 08:56 it's not for today.

Unlike any of the evidence tendered by the SSG or any party whose interest appears to be adverse of that Paramount, Paramount's evidence relating to the pools which are of interest to it was of ID 99 quality. Paramount followed the process as set out in ID 99-1 which remains the process.

I want to comment, just briefly, on some issues that were raised by some parties as to pressure; and while they will intersperse with other aspects of the argument, remind you of what you said - when I say "you" I mean the Board - in General Bulletin 28.

General Bulletin 28 2003, page 3, the Board said and I quote:

> "The Board believes there is a
> 08:57
> deficiency of pressure data that must be addressed. These data need to be collected and submitted to the Board as soon as practical to allow for their integration into the geological study."

Effectively, you repeated that concern at page 5 of that bulletin. Why did the Board do so? Principally for this reason: More pressure data would allow for a more accurate gas pool delineation.

That's, in fact, what's happened as you have
08:58
seen demonstrated through the Paramount presentation, the new and additional pressure data, together with the shut-in of the gas wells, has provided us with more current data.

We hear the SSG saying it isn't enough and it isn't of the right quality. This Board told industry it needed more and it needed the more for specific reasons.

How much more is enough is an open issue, but we have more, and Paramount has utilized it. It cannot be dismissed with a slight of hand that has been put forward by parties such as the SSG and Petro-Canada.

Paramount submits that the Hardy Wabiskaw McMurray A pool is comprised of 25 smaller gas pools based on the following evidence: The available data, pressure and production, was of sufficient quality and quantity to definitively justify the pooling decisions advanced by
08:59
Paramount in the Hardy field.

Pressure response at Hardy dominated by McMurray where approximately 80 percent of the gas resides, thus any concerns regarding commingling are minimal.

Initial pressures and post production pressures are essential to determining hydraulic communication; a stratigraphic analysis and mapping cannot answer this question alone.

High permeability is seen on core, point source, permeability, and supported by well tests, interwell
09:00
scale permeability, should allow pressures to equalize within 4 to 12 months of shut-in if, in fact, there is communication.

The pressure data down hole and wellhead through approximately 20 years to display distinct pressures in pressure decline trends are ally. Recent virgin pressures from new wells in an area that is significantly depleted further reinforce the position advanced by Paramount.

It is important to remember that wells within each pool show excellent coherence with other wells in the same pool. Differences exist where there is pool discontinuity.

Good linear material balance plots are possible; nonlinear material balances can be explained by water influx and poor continuity within pool as seen on 09:01 seismic. The high confidence material balance data represents approximately 73 percent, the oil and gas in place. The plot pools representing lower confidence or scatter are separated.

Production history, decline analysis, differences also support smaller pools. Gas/oil or gas/water contact differences support Paramount's conclusion that there are smaller pools within the Hardy area. Structural mapping and seismic data also support the smaller pool position.

The RGS concluded that there were a number of 09:01 extremely large and complex Wabiskaw McMurray gas pools in the gas over bitumen area of concern. The technical evaluation put forth in this hearing by Paramount establishes, in my submission clearly, that using integrated data from many sources, including pressure data, which is newly available only recently because of the shut-in of the gas wells, demonstrate that the Hardy Wabiskaw McMurray A pool is definitely not one pool, as the current RGS-driven G orders have deemed. The conclusion of 25 pools was reached prior to the acquisition of the late shut-in data. The 2005 data merely reinforces this conclusion.

On the whole, surely an integrated analysis is the preferred approach, with pressure, production, seismic and geology, that is what we need.

The SSG relied only on the geological evidence

09:03

provided in the RGS to reach its conclusions. I submit that everyone in this room who has a technical knowledge of the issue would conclude that the integrated approach is the correct approach.

Gas pooling should not be defined by stratigraphic analysis and mapping alone, but combined with pressure and production data as Paramount has presented. The RGS mapped the Wabiskaw D shale to be approximately 1 metre or greater in the area with the exception of two breaks. The only noncommingled pressure data corroborates that the shale

09:03

is sealing for that pool. This finding is consistent with the Board's previous interpretation in Decision 2003-23 that these pools are generally one to five sections in size. The production history or design analysis also, as I said, supports the position advanced by Paramount.

Clearly, all one needs to do is look at the pressure results as a result of the period of shut-in, they don't lie, they don't mislead. If you take that fully integrated data and incorporated it into your analysis, it demonstrates a number of pools rather than the single pool.

I want to now turn to potentially recoverable bitumen. ID 99-1 defines potentially recoverable bitumen as bitumen in oil sands that has a minimum thickness of 10 metres with a minimum bitumen saturation of 50 percent. Consideration must be given to the volume of the bitumen 09:04 encountered, the geological depositional environment, the presence of associated water zones and the available well control.

As I previously noted, ID 99-1 is totally silent as to the notion of accommodation space. The SSG was charged with making recommendations respecting the production of status of gas wells; however, it appears that it only recognized a portion of the potentially recoverable bitumen in determining its recommendations. It also appears that the SSG did not at any time consider the volume of the bitumen 09:05 encountered, the presence of associated water zones, available well control, or the depositional environment. That's a must.

The bitumen leaseholders themselves such as JACOS, Imperial Resources, did not provide any representation or evidence which support the existence of potentially recoverable bitumen within those gas pools modelled by Paramount.

I'll just stop for a second, Mr. Chairman. These are well-publicized proceedings. Everyone engaged in the industry knows of these proceedings. That certainly includes the bitumen leaseholders. The fact that they're not present speaks volumes on these issues.

Paramount defined the existence of potentially recoverable bitumen with its simulation studies as well as an

09:06

analogy to existing SAGD projects. The SSG states in volume 2, page 223 of the transcript, the primary consideration that needed to be addressed in this hearing was gas in association with potentially recoverable bitumen. Using the ID 99-1 definition of potentially recoverable bitumen the SSG did not however determine what that was, even though it stated that it was a key, if not the most important issue.

In our submission, the Board should not rule based upon this position with a lack of the complete evidence. Paramount provided evidence on the various pools,

09:07

such as the Hardy Wabiskaw McMurray A pool, Hangingstone McMurray X pool, Corner McMurray C pool, Corner McMurray G pool, Hangingstone McMurray NNN pool and the Hangingstone McMurray KKK pool. In my submission Paramount's evidence is to be preferred, especially in circumstances when none other exists.

At page 233 of the transcript, the SSG states: "The presence of water is a consideration in the determination of potentially recoverable bitumen." This is an acknowledgment that water should be considered but the SSG apparently has not taken the opportunity to analyze what it classifies as potentially recoverable bitumen for this hearing. And the question needs to be asked, why has the SSG or why does it recommend the shut in of gas wherein it has not addressed the issues that this Board demands of it and
09:08
that everybody expects of it? This isn't to be treated lightly. The process is governed by the legislation, by ID 99-1, by the series of general bulletins, by the Notice of Hearing, and there was no party in a more preferred position than the SSG to offer the evidence had it chosen to do so.

I want to now direct my attention to policy considerations. Pressure monitoring. What is the objective of continued or expanded pressure monitoring and who is to decide this? Obviously an open issue, and as I pointed out earlier on, this Board in General Bulletin 28, and indeed I
09:09
believe elsewhere, has expressed a concern about pressure monitoring. But if the gas is going to be shut in, where is the incentive on the part of the gas producers to engage in that process, particularly at its costs or their costs? At what point in time will the pressure monitoring be regarded

as adequate to form conclusions?

Well, we hear from the SSG back in January of 2004 and as recently as this week, the data we have is insufficient and does not do the trick. The basic question then becomes, when is enough enough? And I recognize that more data is better than less data. Indeed that's the premise of the simulation and the modelling advanced by Paramount. But if companies such as Paramount will be constantly met with submissions made by the SSG that you still don't have enough and the SSG itself does not utilize
09:10
what's presently available, then what is the purpose of it all and where is the incentive on the part of the gas industry to participate?

Who is to collate, analyze and form the conclusions regarding the new data? In what forum will the results be discussed? Will there be another hearing? Will it be an inquiry? Will it be a hearing that will affect the rights of parties such as this one? There are many different questions that need to be answered before Paramount can support any further initiatives regarding the gas over
09:11
bitumen issue without clarity as to the end point. And if we have constantly moving targets, such as accommodation space, such as perhaps new and different notions of regions of influence, it's like boxing with a shadow. The problem is the stakes are high for companies like Paramount.

Indeed, we recognize, Mr. Chairman, that the stakes are high for the interests which you're obliged to serve and respect, but that does not mean that private interests are to be compromised. They are to be taken into account in the grand scheme of things.

Wellhead pressure monitoring, Paramount supports alternative initiatives. Much of the gas has now been shut in for more than a year. Paramount has demonstrated that wellhead pressures at the Hardy Wabiskaw McMurray A pool are very different within the currently

09:12

defined pool boundary.

Given the generally high permeability of the Wabiskaw and McMurray formations, greater than 100 millidarcies, it is entirely reasonable to have expected that after 12 months of shut-in the pool pressure will and should have equalized. That hasn't occurred. Clearly, the conclusion to be drawn that these larger pools are really a series of small pools, more like what the G orders indicated prior to the release of the RGS, and the subsequent interpretation of the G orders by the Board based on the RGS.

09:13

Geological correlation is not the same as pressure communication, and widely different wellhead pressures of wells within a single pool that have been shut in for more than a year clearly demonstrate that.

Paramount would support an initiative to collect wellhead pressures across the affected area with the first intent to revise the G orders based on this data. However issues as to who will pay still remain.

I want to comment briefly on the MacKay River pressure monitoring. It would seem that MacKay River project, the SAGD project is currently operating in reservoir pressures of 350 to 500 kPa. Paramount has shown during the final hearing that channels exist that cut through the top seal of the bitumen zone which is between the overlying low pressure, approximately 250 kPa, and the SAGD operations
09:14
within an injection pressure of approximately 750 kPa. Currently, based on similar apparent top seal breaches caused by channel cuts, the Board has ordered many wells to be shut in. Paramount proposes that much can be learned by instituting pressure monitoring in the gas zones above the MacKay River operation.

First, such monitoring will test an RGS premise that channel cuts through top seals resulting in lateral and vertical communication of the steam chamber pressures with the overlying gas zones, or will result in
09:15
that.

Secondly, if there, is indeed, pressure communication between the overlying gas zones and the underlying steam chamber, it will test the premise offered by some bitumen producers, that if communication occurs between overlying low-pressure gas and underlying steam chambers, then SAGD operations will somehow be impaired. This initiative would clearly advance the Board's understanding of key considerations.

ID 99-1, Paramount submitted ID 99-1 applications on all of its pools that were presented in evidence. Paramount went to great effort and expense to address two central questions contained within ID 99-1 to determine if the gas zone is associated with a bitumen zone.

A discussion of whether the bitumen within the
09:16
region of influence is exploitable, not in the X, KKK and G pools, and only one section in the C pool is what we see; an evaluation of the potential effect of gas production on bitumen recovery; multiple sensitive runs, all indicate that depleted gas will have no impact on bitumen recovery in the pools studied.

As to revisions to ID 99-1, and this is go-forward, two central questions contained in ID 99-1 go to the nub of the issue of the gas over bitumen issue. Is the bitumen exploitable within a region of influence? And what
09:16
effect, if any, does continued gas production have on bitumen recovery?

These questions can be addressed adequately only by flow simulation studies and by analogy to existing SAGD projects.

Examination of existing SAGD project reports consistently support the following conclusions: geological heterogeneity and geological facies strongly control SAGD performance.

Lean zones, meaning bitumen zones with higher water saturation, cause steam loss that can be managed by lowering steam injection pressure; and where steam is in pressure communication with overlying gas, such as Surmont, no negative effects have been yet seen with regard to the bitumen recovery. It may well be that breakthrough is

09:17

manageable.

The definition of potentially recoverable bitumen requires consideration of the following: The volume of the bitumen encountered; the geological depositional environment or facies; presence of associated water zones; and available well control.

Paramount submits that at a minimum, it might be wise to revise ID 99-1 to include specific criteria that must be met with regard to volume of bitumen, geological depositional environment and facies, the presence of

09:18

associated water zones and available well control.

Part of the wrangling that's occurred over the years before this Board in respect of this issue may be as a result of the lack of specifics.

Currently, ID 99-1 requires that these issues be discussed but provides no specific guidelines as to what hurdles must be met to be granted approval to produce gas. The apparent introduction of the notion of accommodation space is neither helpful nor consistent with the fact that any change to ID 99-1 needs to be made to a regulation. And let me explain.

It's no longer a question if you use the accommodation space principle of what is there, but what might be there. That's a dramatically different consideration from what is contained within ID 99-1. And I

09:19

remind the Board that ID 99-1 is a regulation, and as I said at the outset, we are all obliged to follow the regulations. We may not like them, but as long as they exist, we follow them. If we don't like them, we can, perhaps, bring about or effect a change.

With the new data that has come available since the Chard decision, the Board is in a position to provide particulars of the more exact guidelines and hurdles that need to be met to be granted approval.

The burden of responsibility has been much

09:20

debated before this Board. The burden of responsibility to show that gas should be permitted to produce is presently squarely on the shoulders of the gas producers, and as I have said before, the issue is when is enough enough?

There is no motivation for the bitumen

producers to cooperate or produce any evidence to support their position if, in fact, it's contrary to the gas producer. And I remind you, look at the notice of hearing for this hearing; look at what this Board commanded.

This Board set forth a process which said if you do not agree or if you've got some issue to take with the February 14th, 2005 filing, then do it by May.

Look at the Petro-Canada submission filed in May. Look at the SSG submission filed in May. And compare those submissions with the cross-examination they conducted

09:21

and with their final arguments. That should demonstrate in spades the point that we make, that there's little incentive, presently, to call upon the producers or bitumen leaseholders to become truly engaged in this process.

Now, if I may stop for a moment, if you want to change the process in its entirety, that may be possible. If you want to change ID 99-1, if you want to ask someone to put in place a new set of regulations or legislation, that may be possible; but we all live within the current legislative and regulatory environment.

09:22

Paramount followed the rules. It followed the rules of an ID 99-1 application. It followed the rules that you set forth in 2004. It followed the rules that you set forth in 2005. And for following the rules, we've seen it be maligned again and again by those who have chosen not to come forward with the evidence contrary to the position that's submitted by Paramount.

If there is data available, why should that data not be made available to you? The absence of certain bitumen producers at this hearing, as I said, speaks volumes. It tells you a lot. Particularly those bitumen producers that Paramount engaged in a dialogue prior to the hearing, and you heard that evidence.

Paramount engaged bitumen producers or leaseholders in a process of discussing the simulation, the

09:23

modelling. They're nowhere to be seen. The Board needs to demand more from bitumen producers.

As I said, although there is apparently no foundation in ID 99-1, the RGS invoked the concept of accommodation space and, no surprise, the SSG picked up on that very quickly.

What that does is allow for an inferring of high quality thick bitumen saturated sandstones where no evidence exists that that is so. The justification, apparently, is that the McMurray foundation is highly

09:24

variable and therefore, there could be rapid lateral changes in lithology.

Until such time as high-density drilling can show definitively whether there is or is not viable exploitable bitumen facies present, this argument has prevailed and leads to hypothetical geology superseding actual geology.

It also leads to a position whereby the Board seems to be, if I read its interim decision, and others seem to be saying, well, let's ignore what is potentially recoverable bitumen, because we don't know that.

In place of that, let's deal with this new concept of accommodation space. Again, I say to you, you may want to do that, but in order to do that, in my submission, when you're faced with a regulation which was put in place at
09:25
the instance of this Board itself, that opportunity is not available unless and until you effect the change and you ought not to effect the change retroactively so as to effect adversely the interests of those parties in this hearing.

The very concept of a rapidly-changing lithology is at odds with what good SAGD performance actually requires, as evidenced by the reports submitted by the SAGD operators.

In short, if one needs to invoke notions such as accommodation space, then one has to ask whether there is
09:26
truly a project at all or a realistic possibility of a project in the first place.

The bitumen producers have already high graded their areas, and I recognize the conservation concern for areas that might not have been exploited or developed at this stage. But surely it's for industry, itself, or the Crown, to signal its concerns.

Conclusions reached regarding SAGD performance, notably, SOR and geological facies, are also time insensitive and can be projected into the future with some confidence.

As a result, what bitumen producers find attractive and unattractive for their SAGD operations, currently, is unlikely to change substantially unless a completely different extraction methodology is developed in

09:27

which case the very underpinnings of the present process are called into question.

Now, Mr. Chairman, I want to move to some specific reply.

We hear the SSG raising what is best characterized as the precautionary principle: Don't take any chances. Well, if, in fact, that is to govern and if, in fact, every element or piece of evidence that's offered is to be regarded as suspect because of that precautionary principle, then we need to all ask ourselves a rather

09:28

fundamental question, Why are we here at all?

Of course it's important to be guarded, and we recognize your mandate, but that does not mean ignore reality.

Comments were made on the risks to bitumen recovery and sterilization. The SSG and Petro-Canada state that it has concluded that production of gas presents an unacceptable risk to bitumen recovery and indeed there exists a risk of sterilization. Presumably the SSG and Petro-Canada are relying upon prior decisions as opposed to any evidence that they offered in this hearing.

Comments were made on the use of the RGS versus integrated studies. The SSG states that pooling decisions were based -- its pooling decisions were based on the RGS. Clearly, Mr. Chairman, more is expected. Clearly, 09:29 the integrated approach is the preferred approach. And indeed I remind you, that this Board has repeatedly said we want more pressure data, and you want more pressure data for at least one fundamental reason, there may be others, that it will help us delineate gas pool boundaries.

The RGS is primarily a geological tool and not appropriate, particularly if used exclusively to reach accurate interpretations of pooling. Paramount demonstrated how using all available information, geology, engineering, seismic, structure, fluid contacts, results in a superior 09:29 delineation.

Much was said about the Hardy pool, the SSG criticized many aspects of EPIC's work on the Hardy Wabiskaw McMurray A pool. The SSG stated that EPIC ignored the issue of vertical isolation between gas pools in bitumen-bearing

zones. EPIC stated in its presentation that once the well
groups were established, EPIC then went back to verify that
the completion history allowed it to make its assessment of
that pooling, and then EPIC looked at whether or not the
vertical isolation was present. That appears in the
transcript at page 895. EPIC did not ignore the issue of
vertical isolation between gas pools.

The SSG asserts that pressure data utilized in
the EPIC study suffers shortcomings. There are over 300
pressure points in the Hardy area. The pressure data both
09:31
downhole and wellhead over the past 20 years displays
distinct differences in pressure decline trends areally. The
majority of the pressure points available are not redundant
or unstabilized pressure measurements. It is a third party
consultant's professional opinion, a consultant with years of
analyzing pressure data, that there is sufficient quality and
quantity of data to definitively justify the pooling
decisions as set forth in the EPIC study.

The undetected errors mentioned by the SSG are
extremely limited in number and do not have any impact on
09:31
EPIC's interpretation of decline and drainage trends. The
SSG was not able to demonstrate that such an impact existed.
And I might say this: It appears that the SSG spent a
considerable time and effort, perhaps inordinately, in
looking for these errors or any inconsistencies, at a time

when, I submit, it ought to have been addressing the issues which it needed to address under ID 99-1, the ones that it said it would address or needed to be addressed in its January 2004 submission. It spent its time apparently picking away rather than presenting.

The surface pressure used by EPIC in its study did not invalidate EPIC's interpretation of good continuity within gas pools. As a matter of fact, the wellhead data along subsurface and production data supported EPIC's conclusions.

09:32 With respect to the SSG's claim that a reasonable interpretation of the pressure data is that Hardy is a single pool comprised of several geological sequences with limited vertical and lateral communication between good permeability sands, that may be true if only segments of the engineering and geological data are analyzed. It certainly is not supportable when all of the geological and engineering data is incorporated.

The SSG stated that EPIC's failure to properly match pressure SCADA with its simplistic two-tank model and 09:33 it ignored the requirements to use as many tanks as needed. EPIC's response was to the point, that in its professional opinion it resolved the issue satisfactorily using two tanks so that there was little merit in using more tanks.

EPIC again validated its pooling using

differences in well declines between each pool. With respect to differences in well declines within EPIC's pools, such differences can be explained with surface operations and this was acknowledged by the SSG, it appears, in its final argument.

The SSG states that Paramount did not consistently employ the available geological and geophysical information and that the Board should not consider its study to be integrated in this respect. Paramount used the RGS study, a study that was comprised of all of the available 09:34 geological data present at a time. EPIC used an integration of the RGS information as well as engineering information to resolve the pooling in the Hardy area.

And I say again, everybody in this room with a technical appreciation of the issue knows and understands that the fully integrated approach is the correct approach.

The SSG stated that EPIC's volumetric reserves were not based on an independent geologic review, however it acknowledged there was an approximate agreement between the volumetric material balance and decline reserves. 09:35

The main argument presented by the SSG in the Hardy Wabiskaw McMurray A pool was that the pressure data was of poor quality and inadequate quantity. Paramount's response to that submission is simply put that EPIC attempted to integrate all available data that was considered valid.

In such cases, it is unrealistic to expect that all possible data fits with all other data perfectly.

The challenge, and it is a challenge, is to find a model that satisfies as much of the data as possible. It's easy to say you have nothing or it's no good and be dismissive. The difficult challenge and the one that's to be expected to be met by professionals such as EPIC is to take the data and work with it.

The challenge is to find a model that satisfies as much of the data as possible. It would be far
09:36
easier to throw up your hands and say we don't have enough. But that's not going to answer anything. Despite all of the attempts to undermine the work conducted at Hardy, the simple fact of the matter is that the wellhead pressure taken many months after the field has been shut in shows large pressure differences between pools as defined by EPIC. It is clearly supportable, as determined by Paramount and supported by CNRL, to suggest that Hardy is one pool.

Now, Mr. Chairman, I probably will have about 20 minutes to half an hour. I'm happy to continue, but if
09:36
you wish to break now I'll break now.

THE CHAIR: If you'd like to continue, why don't you do that, sir.

MR. SALI: If my voice wanes, let me know.

Accommodation space. And as I've said, spoken of accommodation space before, the SSG asserts that no party challenged the notion of accommodation space during the final hearing. I'm not quite sure what that means, but at the interim hearing Paramount, for one, did not accept that this concept should be applied. Indeed I repeat the position.

ID 99-1, the SSG asserts that an expanded definition of ID 99-1 from General Bulletin 2003-28 be adopted in this hearing to render the final decision by the Board.

I want to stop for a moment, Mr. Chairman,
09:37
members of the Board. This is not a general inquiry or an inquiry to determine what might be a good idea. You conducted one of those back in the '90s, and at that time as you did that, rights and obligations or rights and interests were of course not really at stake in the specific sense.

When you have a hearing like this, rights and interests are directly affected and we shouldn't make it up as we go along. So it is wrong in principle to say, okay, let's change the rules in midstream and do it retroactively so that the game that we played for years and upon which this
09:38
hearing is premised is really changed in a retroactive sense.

Again, as I said to you earlier on, it's a little bit like shadowboxing, it's not right nor is it fair, and if there is going to be that kind of a suggestion made, it does adversely and unfairly affect the interests of private parties, and I understand the balance of interest to be dealt with, but you need to be always vigilant of the process and what governs that process.

With the expanded definition proposed by the SSG is the following: Current commercial in situ technologies in the Athabaska and McMurray are new and developing therefore these schemes do not define potentially recoverable bitumen. This is tantamount to suggesting that ID 99-1 be revised immediately during this hearing in midstream, with nothing being put forward by the SSG to
09:39
support that position.

Secondly, the expanded definition is equivalent to suggesting that the pilot results be ignored, as they may not reflect actual future activity. This is not acceptable. ID 99-1 cannot be changed and ought not to be changed so easily and must prevail at least in its current form, as I say for the purposes of the resolution to this hearing.

Lastly, the only data we have on SAGD performance is from existing projects. One cannot ignore
09:40
that data. The F pair at Hangingstone was abandoned for fundamentally geological reasons.

Potential recoverable bitumen. The SSG asserts that no party has provided evidence to support the adoption of new or different criteria for defining potentially recoverable bitumen in McMurray. We say that is not so. In these proceedings, Paramount advocated that flow simulation templates could be developed through flow simulation as used to assess any well or group of wells. This is a more appropriate technique to assess what is potentially recoverable bitumen.

As the abandoned Hangingstone F well pair has shown, there is clearly rock that does not meet an acceptable level of productivity or SOR. These examples of success and failure and some points in-between could be modelled and used

09:41

in templates to assess other areas or wells as Paramount showed responding to the Nexen IR.

Facies analysis. Comments were made that the models were not constructed with core data. Petro-Canada states that Paramount did not use core data to calibrate the discriminant function model. That is not so. Core data was used to calibrate the discriminant function model and the log analysis model. Both of these products were used as input into the geological model.

Discriminant function analysis. The SSG

09:42

states that the discriminate function work is flawed and that facies that are picked have a 40 percent chance of being incorrect. It appears that the SSG has not understood the methodology that was employed. Discriminant function analysis is a standard well-understood technique that was applied properly by Paramount for these studies. Those results have been confirmed through core.

Comments were made that facies were not petrophysically distinct. The SSG stated that it is difficult to see any match between the facies distributions and porosity distributions.

The reports provided in the February 14th evidence show tables of summary data and multiple histogram charts at that demonstrate the clear distinction between the facies.

09:42

In addition, hundreds of histograms were provided to Petro-Canada during the IR process which also show the same relationships.

Petro-Canada noted that the petrophysical properties are not consistent with the facies. Paramount showed that tables of data where the volume of shale, porosity and permeability all change as would be expected moving from sand to interbedded sand to interbedded mudstones. Most of the data is contained in these facies.

Volumetrically small samples such as breccia 09:43 or marine sand are going to have more fluctuation because there is less data on these facies.

Further, in some cases, Petro-Canada noted that the volume shale with the facies varied from pool to pool. This is the very reason why one conducts geostatistical analysis; it allows one to recognize differences between geographical areas. None of this is unexpected, and none of this constitutes a flaw in the modelling.

Petrophysical analysis, the SSG and Petro-Canada suggest that the log-derived porosity needed correcting to core-derived values and that as a consequence, the permeability is too low.

This, as was discussed in detail with Mr. Crain, is not the case. The data as calculated provides
09:44 a satisfactory match. The answer plots show the match was included in the evidence.

The correction that the SSG is advocating is not appropriate, based on Mr. Crain's decades of experience in performing these studies.

Further, as explained in the evidence in chief, even if this was necessary, there is some uncertainty as to the matching the logs to the cores to the accuracy of a 10th of a metre to exactly line up core data.

Comments were made on porosity, permeability
09:45 transform. The porosity and permeability data has been criticized. The transform that was used to determine permeability was based on core within the study area, but Paramount showed that this same transform was valid had Paramount incorporated 185 wells from a much larger regional

area.

The porosity and permeability data that was used in the modified reservoir sandstones was taken from the Chard Leismer hearing, data that was provided by Petro-Canada.

Petro-Canada suggested that because some data may have been vertical permeability data rather than horizontal data, that this invalidates the result of the transform.

In the data Petro-Canada presented only a few
09:45
data points were noted as vertically permeability measurements. The transform, which accurately reflects the porosity to permeability data of the 185 wells, which represents more than 3500 data pairs, would be unaffected by these vertical data.

Additionally, the core data tends to be taken in the best reservoir quality and in these sands, the vertical permeability is very close to the horizontal permeability.

Petro-Canada, itself, in the Chard modelling,
09:46
used vertical to horizontal permeability ratios of 1.0, meaning the two measurements are the same.

Geostatistics. The SSG and Petro-Canada claim that the geostatistical approach used by Paramount is not valid and contend that the facies modelling, for example, should have employed object-based methods rather than cell-based methods.

That is exactly contrary to what is recommended by Dr. Clayton Deutsch, an acknowledged expert in the area.

The methodology and approach employed by Paramount is consistent with the principles put forth by Dr. Deutsch in his textbook of 2002. What the SSG and Petro-Canada may think untested in that approach is irrelevant.

09:47

It is also noteworthy that Petro-Canada used geostatistics, itself, at its MacKay River commercial project. With such strong views on the subject and with the experience needed, why did it choose not to present its own models in this hearing as an alternative?

Covariance reduction factor, the SSG states that because the covariance reduction factor was set to 1.0, the data will be too widely scattered.

Paramount did not need to invoke this change in these models. Histograms and summary statistics were

09:47

compared between the input data and the final geological models and there was no cause to invoke this parameter.

In its IR response, Paramount produced hundreds of histograms for Petro-Canada showing input versus simulated data. The only question that arose regarding the histograms was due to an incorrect diagram having been included in Paramount's evidence.

History match. Paramount matched all available pressure data that was appropriate for use. It showed that the data highlighted by other parties was either wellhead data or data from other zones. Neither were appropriate to match.

Petro-Canada suggested that because data was sparse, the history match was uncalibrated and went on to say that because there was no SAGD data to match, how can the 09:48 model be matched?

A lack of an ideal data set is not a reason to abandon the work or the conclusions based on this work. The methods used to describe the reservoir, core, facies, petrophysics, geostatistics engineering, have been used in many other situations, where there was much more data available. This was not the first time the Paramount team engaged in this undertaking; indeed, it is an area of expertise for that panel.

It is not solely the match to existing 09:49 pressure that builds confidence in the model, it is the entire approach experience and expertise of the team collectively.

Comments were made on volumetrics. The volumetrics derived from the RGS do not match the material balance of the model pools, nor should they be expected to.

The RGS was a geological modelling exercise and did not, to Paramount's knowledge, make any attempt to reconcile material balance or production data to the volumetrics of the pools it defined. There's no surprise that there's no agreement.

2-D versus 3-D modelling. Petro-Canada and the SSG have suggested that 2-D models are inappropriate to investigate the gas over bitumen issue.

2-D simulations are standard practice,

09:50

especially in thermal situations where computer resources are pushed to extremes to run the simulations.

Perhaps the Board should be reminded that Petro-Canada's own submission in the Chard hearing comprised only 2-D simulations using layers with constant properties with a Y dimension of 700 metres, 750 metres. Is Petro-Canada prepared to retract its evidence from the Chard hearing on the same basis? Not likely.

2-D simulations are standard practice and give a good approximation of production performance and steam

09:51

chamber development.

3-D models. The allegation or suggestion is we didn't use the correct gas contact data. This data was not used by the model as Dr. Ali indicated.

Dr. Tan confirmed this for Petro-Canada during cross-examination, moreover Paramount reran the simulations modifying this datum, and demonstrated that there was no change to the results. Some parties seem to lack familiarity with the simulation software. That may have led them to conclude that there was an error, but it was not.

Contention is that we didn't use the correct units, so the model results should somehow be abandoned.

British rather than metric gas density was mistakenly entered by Paramount in the simulations. The models were rerun, the results were the same.

09:52 Petro-Canada suggests that if parameters can be entered incorrectly, then how can the model be believed?

When cross-examined on this point, Dr. Ali suggested it would not make much difference because the value was already low compared to the density of bitumen. By either measure, it is less than one and the density of water is 1,000 and bitumen, of course, is more dense than water. And not to be forgotten, the gas is situated above the bitumen.

The simulation process is sensitive to
09:52 different variables to different extents. When this error was detected, it was also recognized as being of little import or impact by Dr. Ali. The changed runs confirmed that to be so.

There was some comment on the Peaceman

indices. There are many parameters within the simulator and in practice in the field that could mitigate this slight difference of recovery.

There's also numerical dispersion within the simulator results. The difference noted by the SSG and Petro-Canada cannot be considered significant.

Using that 6 percent indicator is akin to the Mark Twain comment provided by Petro-Canada earlier on: The Mississippi River will be a mile long in a few years.

Comments were made about the quality in the
09:53
channel does not produce the same rates as the UTF. All of the 3-D cases that were run with gas zones directly connecting the bitumen zones, any gas zone connected directly to bitumen zones presents a challenge. We know that.

But one should not confuse performance to geology with performance related to low gas pressure. The UTF has no gas connected to bitumen and therefore it should be no surprise that the rates are of a purely hypothetical geology. The Paramount model with homogeneous sand with connected overlying gas zone, does not match an actual field
09:54
sample with no connected gas.

The model results from a geostatistical, geology and geological sensitivity runs compared very favourably with the existing field data.

Comments were made to the effect that the models artificially were constructed to demonstrate no gas pressure. I will deal with that in due course.

Nexen. Nexen stated in its final argument the lean zone encountered at Long Lake is a naturally-occurring thief zone. The pilot hit a lean zone and suffered a loss of steam and is now operating at lower pressure with lower temperatures and lower rates.

Paramount submits that the lean zone described by Nexen is not an analog to a depleted gas zone. It is important to know the characteristics of the lean zone in
09:55 order not to be misguided or misled. The lean zones described by Nexen contain high water saturations and the high water saturations encountered resulted in the loss of steam, the decrease in the size of the steam chamber, and the operating pressure and subsequently, the bitumen rate.

The lean zone encountered by Nexen is more related to what happens when top water is initially contacted, thus clearly showing that the presence of top water is a serious concern and needs to be accounted for in the determination of potentially recoverable bitumen.

09:55 The C pool has extensive and thick top water as mapped by the RGS and Nexen's experience calls into question the suitability of the C pool as an attractive area to exploit bitumen.

I want to now comment on two other issues.

One, a submission made by Petro-Canada. When Ms. Kolber made the Petro-Canada submission, it was perfectly clear that it was a carefully crafted, well thought out submission. The reason I say that by way of introduction is that the comments made by Ms. Kolber on behalf of Petro-Canada should not be regarded as a slip of the tongue. Here is what she said. At transcript page 2030, lines 5 through 9:

> "To summarize the concerns with Paramount's modelling, it is clear that the models were artificially
> 09:57
> constructed to demonstrate that overlying gas pressure does not impact SAGD performance."

Put bluntly, Mr. Chairman, that's another way of saying that Paramount and its team of independent consultants conspired to fabricate evidence to present an artificial construct. Nice words for deceit, nice words for misleading. There's absolutely no basis in fact for such a statement.

And I ask you how would you feel if you were the panel of independent consultants or Mr. Norris or the
09:58
president of Paramount if you were told or it was suggested that it is clear that what you did was artificially construct something to demonstrate a particular result? Nothing short of an unqualified complete apology and retraction of that statement will do.

Statements like that take us to a new low in these proceedings, and while that statement may well play itself out in a different forum, I call upon Petro-Canada to do what I have suggested. More over, if memory serves me correctly, that statement was made by Petro-Canada in the presence of its senior in-house counsel.

Lastly, Mr. Chairman, I want to speak to the issue of process. This panel is well aware of Paramount's position respecting the need to ensure a transparent process, and for the panel to make disclosure of the information

09:59

identified in the communications that I, as counsel for Paramount had with Mr. Perkins, all of which have been marked as exhibits in these proceedings. That position remains.

Paramount makes its closing submission in accordance with your directions. However, in doing so we do not want to be seen as acquiescing in the process that has been followed to date, which remains a matter of considerable concern.

I want to take a moment to quote from one of the published texts dealing with issues such as these, well

10:00

known to legal practitioners certainly in this province and elsewhere in Canada, Jones and de Villars "Principles Of Administrative Law," fourth edition, 2004, at page 259.

> "The issue of whether and how much of the tribunal's file is available to the

> party affected is a source of difficulty with many tribunals, there is often a tendency to refuse to disclose the file to the parties involved. However, fairness generally requires that all information relied upon by the tribunal when making the decision be disclosed to the individual. Failure to do so deprives the tribunal of jurisdiction and 10:01 renders a decision void.
>
> The information to be disclosed includes reports prepared by the tribunal staff or any other report which the tribunal has relied upon in making its decision."

The jurisprudence in this country, in my submission, is of a like effect.

I want to draw your attention as well to section 4 of the Administrative Procedures Act, which reads 10:02 as follows:

> "Before an authority in the exercise of a statutory power refuses the application of or makes a decision or order adversely affecting the rights of

> a party, the authority (a) shall give the party a reasonable opportunity of furnishing relevant evidence to the authority; (b) shall inform the party of the facts in its possession or the allegations made to it contrary to the interests of the party in sufficient detail, 1 to permit the party to understand the facts or allegations; and 2, to afford the party a reasonable
>
> 10:02
>
> opportunity to furnish relevant evidence to contradict or explain the facts or allegations; and (c), shall give the party an adequate opportunity of making representations by way of argument to the authority."

We remain of the concern that we've had earlier, we recognize that you've called upon us for final argument. We believe that we are entitled to more. We know, of course, that you're obliged to issue reasons and explain your

10:03

decision. We await that. But we do ask that you take these submissions into account before you issue your decision.

Mr. Chairman, I'm reminded that apparently I overlooked one matter to be addressed, the issue of the representative well control in models.

The SSG stated that the wells that were used contained poor-quality bitumen and therefore the results were skewed accordingly and that the well spacing was inadequate to build reliable models.

The SSG also stated that Paramount used only wells that contained muddy intervals in the upper portions of the McMurray and poor bitumen reservoir quality in the lower portions of the McMurray. That is not so. Paramount used all wells present which included well-developed lower and upper McMurray sands, the chimney wells. Subsequently
10:04
Paramount modified the geology to include superb quality bitumen channels with porosity and permeability properties that were similar to the models presented by Petro-Canada in Chard.

Petro-Canada stated that the presence of better quality bitumen sands just off the southeast corner of the Corner C pool proves that the Paramount geological modelling is wrong and again cited well spacing as the argument to try to discredit the geological model. This underscores the reason why pool applications were submitted.
10:05
The geology changes. Imperial Oil is drilling wells to the southeast to the Corner C pool. It is not drilling wells within the C pool. There is a reason for this. No doubt the sand continuity and quality may be better to the southeast of the C pool than under the C pool.

Let me close by saying this, Mr. Chairman, and again of course subject to any comments or questions you may have of me, it is important in my submission that you reflect upon truly what the issues are, who addressed those issues and how they were addressed, and if the reaction is to be there's virtually nothing that can be done in order to dissuade a particular view, then that may be okay. I don't think it's right.

The position I want to leave you with is this: Back in 2003 this Board began the process and what you did is
10:06
you said it will take a particular form. This Board commissioned the SSG to in effect be, if you will, the presenter of the evidence to deal with the matters of concern that the panel is called upon to address.

So what you have to do effectively as the judges or the jurists, you three people need to sit back and say to yourselves, has the SSG presented to us the kind of evidence which impels or compels us to reach the conclusions which it urges; has the SSG directed itself to the issues that it needed to direct itself to; has the SSG addressed ID
10:07
99-1 as required; has it addressed the issues as required? And you also need to say to yourself, what about the other parties, what about Paramount, what has it done, has it addressed the concerns and the issues? That's the first part.

And if you answer the question by saying, Paramount, by way of example addressed the real considerations in a fuller sense, you then say to yourself, are we comfortable or confident that the matter in which it addressed these issues is such that we can rely upon that presentation? I submit to you that it is, and I submit to you that as you address that consideration you completely disregard comments made by parties such as Petro-Canada that I directed you to earlier on.

Subject to any questions, that completes my 10:08 submission.

THE CHAIR: We have no questions, Mr. Sali. Thank you very much.

MR. SALI: Thank you.

THE CHAIR: We'll take our morning break. We will be back in 20 minutes.

(ADJOURNMENT).

THE CHAIR: Thank you. Please be seated. Mr. Rowbotham, would you like to proceed.

MR. ROWBOTHAM: Thank you. Mr. Chairman, and 10:31 members of the panel, you will happy to hear that I intend to be very brief.

You may recall that when Mr. Paul Evans, the President of Stylus, appeared as the witness for Stylus in this proceeding, he began with an opening statement in which he summarized the position of Stylus with respect to the recommendation of the SSG set forth in Section 4.1 of the SSG's February 14th, 2005 submission, that the SSG had reinterpreted the 7-28-82-12 west of the 4th well in the Divide McMurray R pool and the 6-27-82-12 west of the 4th well in the Divide McMurray undefined 074 pool as a new two-well pool on the basis that the gas over water over bitumen zone in the McMurray channel in the 6-27 well had gas/water and gas/bitumen contacts that are within 0.3 metres and 1.1 metres respectively of the same contacts in the 7-28

10:32

well.

In the Stylus submission dated May 9th, 2005, Exhibit N-3 in this final Phase 3 proceeding, Stylus provided new evidence that it believed would assist the Board in determining the appropriate pooling for the 7-28 well.

This new information came from five oil sands evaluation wells drilled on section 28 that were released from confidential status in March 2005. These wells were not available to the SSG in formulating its February 14th, 2005 recommendation. Of the five wells, all located within one

10:33

mile of and surrounding the Stylus 7-28 well, none encountered gas in the McMurray B2 sequence.

Stylus incorporated two of the new wells located between the 7-28 well and 6-27 well into a cross-section to demonstrate the structural relationships between the wells.

In the AA/15-28-82-12 west of the 4th well and the AA/8-28-82-12 west of the 4th well, the top of the McMurray B sequence is structurally below the gas/water and the water/bitumen contacts in the 7-28 well and the 6-27 well.

Furthermore, the B2 sequence in the 15-28 and the 8-28 wells is bitumen charged and therefore lateral pressure communication through bottom water is not likely.

Stylus's interpretation is that the Divide
10:34 McMurray R pool is structurally separate from the Divide McMurray undefined 074 pool and that the SSG was correct in their original assessment of the 7-28 and the 6-27 wells as a single-well pool.

In the reply of the SSG to Stylus's submission, Exhibit M-11 in this final Phase 3 proceeding, the SSG offered the interpretation that a structural high connects the 7-28 and 6-27 wells, that the 15-28 and 8-28 wells define the north and south edges of this high, and that gas is continuous between the 7-28 and the 6-27 wells.

10:35 The limitation of well control is that there is always some space between wells and there is no amount of drilling that could prove, with certainty, that there is no structural high between the wells.

Given the spacing and orientation of the wells, however, Stylus submits that there is no geological evidence to support the SSG's interpretation as the most likely interpretation. In fact, the SSG submitted no evidence whatsoever to support the SSG's interpretation.

Stylus also noted that the SSG has generally supported production from the McMurray B2 sequence and in the recommendation table included in the January 26, 2004 recommendations of the SSG for the Phase 3 interim hearing, Exhibit H-2 in that proceeding, the SSG recommended that 49 of 53 McMurray B2 sequence or McMurray B2 channel gas zones

10:36

be allowed to produce.

For this final Phase 3 hearing, the SSG has changed its recommendation on only five McMurray B2 sequence gas wells.

In summary then, Stylus recommends that the Board maintain the current status of the Divide McMurray R pool as a single well pool and allow the McMurray B2 sequence in the 7-28 well to produce.

It is Stylus's submission that no case has been made by the SSG which would reasonably support any other

10:36

interpretation and accordingly, it is recommended that the SSG's interpretation be rejected.

With respect to the broader issues identified in the letter from counsel for the Board dated August 8th, Stylus takes no position, as Stylus's participation in this proceeding has been really limited to the status of the 7-28-82-12 west of the 4th well.

Thank you for your attention to the submission of Stylus in this proceeding. Subject to any questions, those are my arguments.

THE CHAIR: We have no questions, Mr. Rowbotham, thank you very much.

MR. ROWBOTHAM: Thank you.

THE CHAIR: I'm taking it there are no
other parties that have primary argument, that is, argument
10:37 other than some reply, but I will just go down the list to be
doubly sure. And you don't need to respond if you have
nothing. BP Canada. Devon Canada. EnCana Corporation.
Mr. Perkins.

MR. PERKINS: Mr. Chairman, with respect to EnCana, Ms. Ho had forwarded a letter to parties and counsel. The letter is dated August 10, 2005, it's further to the matters that Mr. Reid addressed at the outset of the hearing and that are addressed in Exhibits E-1 and E-2.

I communicated with Ms. Ho and she had asked
10:38 or suggested that we enter this letter on the record just for
the sake of completeness and as I said, it's just further to
the submissions that Mr. Reid made at the outset of the
hearing. So perhaps we could do that, sir.

I believe the next EnCana exhibit to be E-3.

THE CHAIR: Yes, sir.

MR. PERKINS: Thank you, sir.

EXHIBIT E-3 - ENCANA LETTER DATED AUGUST 10, 2005.

THE CHAIR: Japan Canada Oil Sands.

MR. RENNIE: Excuse me, sir, just a very brief comment.

THE CHAIR: Please come to the mike, sir.

MR. RENNIE: William Rennie with Japan Canada Oil Sands. Just a very brief comment.

10:39

Petro-Canada will continue to make some comments regarding Japan Canada's position as part of the PCEJ group.

THE CHAIR: Thank you, sir. PrimeWest Energy. Paramount Resources.

So in terms of reply argument, we understand Mr. Sali's replies were given. Going back up the list, ISH Energy. Mr. Mooney.

MR. MOONEY: Mr. Chairman, members of the Board, I don't have much for reply but I do have two points I

10:40

want to address.

The first arises from the SSG's argument in support of its position that cemented horizons within the Kirby Wabiskaw B valley fill are discontinuous concretions that do not create seals.

The SSG referred to cross-sections from the 02 and 00/10-33-073-08 west of 4 wells, where I quote: "Calcite cemented horizons vary in thickness and do not correlate straight across from well to well."

To be clear on this point, although Mr. Mathison admitted that there was a difference of two cemented horizons over 15 metres, it is important to read his evidence in this regard in its entirety, beginning at page 702 of the transcript.

Under cross-examination Mr. Mathison stated
10:41
that his original correlation was in error but that there was a calcite cemented horizon at approximately the same elevation in the reservoir. So there was a correlation, though, not directly across, which was not unexpected, according to Mr. Mathison.

Significantly, in the end, there are still consistent multiple zones present in both wellbores and you will recall ISH's evidence that all it takes is one of these to form an effective seal.

ISH would also like to respond to the point
10:41
that was made in the SSG's argument that the wells used in the reservoir quality study submitted as part of ISH's February 14th, 2005 submission, were not in the RGS. Specifically, the SSG noted that ISH acknowledged that some of the petrographic data it used for comparison with the

Kirby Wabiskaw B valley fill was outside of the RGS study area.

While, strictly speaking, it is true that one well, the 100/07-27-088-17 west of 4 well was outside the RGS and the other wells were not centrally located in the Tar and Ells fields, in decision 2004-45 at page 5 the Board stated as follows:

> "The Board accepts that the Wabiskaw
> sands in the northern portions of the
> study area (Ells and Tar fields) are
> 10:42 more of a regional marine nature than
> those in the Kirby areas to the south
> and therefore have a more consistent
> thickness because of the environment in
> which they were deposited."

In ISH's, view the regional nature recognized by the Board with respect to the thickness is equally true of the quality of this reservoir and it is for this reason that these wells used by ISH in its comparison, are both relevant and significant.

10:43 Those constitute the reply submissions of ISH Energy.

THE CHAIR: Thanks, Mr. Mooney.
Canadian Natural. Mr. McGovern.

MR. McGOVERN: Yes, good morning,

Mr. Chairman.

CNRL maintains the positions set out in its argument which will not be repeated here. I would like, however, to respond to a few points made by Mr. Block on behalf of Nexen and Mr. Mousseau on behalf of the SSG.

Mr. Block has suggested that CNRL's position on the confusion created by the SSG and Nexen core review "paralyzes" the Board. Nothing could be further from the truth. To the contrary, Canadian Natural is suggesting that the Board must not act precipitously.

10:44

Without new evidence that is compelling, this Board should not change the produced status of those wells previously found to be isolated from potentially recoverable bitumen by the Wabiskaw D shale.

The evidence being proffered by Nexen and the SSG is insufficient to justify the blanket dismissal of the Wabiskaw D shale as a seal.

Mr. Mousseau would have this Board make such a ruling notwithstanding the confusion on the basis of the risk posed. This, however, fails to consider the pressure

10:44

segregation and other evidence this Board has previously considered in finding the Wabiskaw D shale to be a seal, and in our view, further supports CNRL's position that these issues should only be looked at on a pool-by-pool basis.

The SSG suggests that CNRL has submitted that any decline in top gas pressure will make SAGD more difficult and that this evidence should be given weight. What CNRL has said is that SAGD will be inherently more difficult when top gas is present. We have also stated that a decline in pressure may make SAGD more difficult.

To clarify this point, what we mean is that SAGD is a complex process. The choice of an optimum development methodology is determined by a complex interplay of reservoir characteristics, depths, mechanical constraints of pumping systems and the economics of both the product,

10:45

bitumen, and fuel, the gas. For each reservoir, there will be optimum operating parameters. In some instances, this optimum operating condition may be somewhat less than the virgin gas pressure. This means it may be advantageous to partially deplete gas pools.

This is partially the driver for all the pilot work on low pressure SAGD. It may simply be that a more efficient SAGD process exists under low pressure conditions regardless of the presence of top gas or water. Thus we cannot state that all depletion is harmful. A more correct

10:46

view is that gas caps and top water is harmful to SAGD and that pressures below or above the optimum operating conditions further complicate the process. This is another reason why CNRL continues to believe that these issues must be examined on a pool-by-pool basis.

CNRL would also like to clarify its position on accommodation space. The SSG has stated that no one has opposed this criteria and that a single 20-metre cutoff must be adopted in all circumstances. CNRL believes that accommodation space is a concept that must be considered but does not support a hard cutoff. CNRL considers accommodation space as only a part of the geologic considerations to be considered under the definition of potentially recoverable bitumen from Decision 2004-045.

Accommodation space is a measurement of

10:47

possibility, that is, can a channel fit in a space. The Board must also consider the probability of a channel being deposited and charged with bitumen.

To use a single hard cutoff is to ignore other geologic evidence concerning the probability the potentially recoverable bitumen even exists. CNRL believes this would be unwise, unfair and does not support such a hard cutoff. Thank you, sir.

THE CHAIR: Thanks, Mr. McGovern. Mr. Block for Nexen.

10:48

MR. BLOCK: Thank you, Mr. Chairman.

Members of the Board, member of Board Staff, I have a short rebuttal both for CNRL and for Paramount.

First in response to CNRL, you heard much discussion about Leismer Chard, decisions were made at

Leismer Chard. Of course we lived through that hearing. Nexen examined in detail the core from Long Lake which of course was not part of the Leismer Chard hearing and there has not been until the SSG and Nexen did their regional work a focused review on available core at Long Lake.

Second, CNRL asserts that the analysis must be done on a pool-by-pool basis but Nexen objects to 17 wells, 11 of the 17 wells that Nexen objects to have no pools they're undefined pools, and second, the RGS on a regional basis examined areas of preserved barriers and areas of
10:49
erosion, broadly speaking that's what the RGS did. In Nexen's submission, it's an extreme regressive step to suggest that the Board cannot act unless there are well-specific or pool-specific analysis in these hearings.

So then CNRL moves to the Newby Wabiskaw T pool, it has six gas wells. Nexen and CNRL advanced at the interim hearing conflicting pressure interpretations on two wells, and of course that's carried through into this hearing. So what do we do in these hearings? We turn to geology. Clearly, and it is manifest on the face of the RGS
10:49
that a unit called the Wabiskaw D shale was mapped across Long Lake, and that decision on a fair reading, the decisions at the interim hearing were made on a geology, on a geology-based analysis of the RGS.

So what did the Board say, what did the Board say at Leismer Chard? It said where present. Well, we will assume that there's a barrier, where it is present greater than .5 metres. So what do the SSG and Nexen do? They go out and look at the rock and see if the criteria is met.

Now, CNRL then responds that the SSG and Nexen disagree half the time on 44 wells. But they never acknowledged once in their argument that each party looked at different intervals, with different lithologies, and of course the thicknesses are not going to be the same all the time.

10:50

Now, CNRL's argument appears to commence from the presumption that a geologic sealing unit exists, and the fundamental point of both the SSG and Nexen is that geologically no such seal exists, you look at the rock, it's just not there. Then Nexen is criticized for not examining core apparently in wells that they were never cored, the gas wells were not cored. There are no cores cut in the gas wells in the Newby Wabiskaw T pool or in any other of the gas wells in Nexen's submission.

So Nexen examined the cores regionally at Long

10:51

Lake area including the closest cores to the only defined gas pools against the regional geologic model and presented its findings to you.

Then finally CNRL refers to segregated pressures. The undeniable fact through all of these hearings is that pressure data is questionable and segregated pressures are extremely sparse. So CNRL asks you to ignore two core studies while presenting none of its own, presume that in areas where there is no core the Wabiskaw D, like the gas pools, the Wabiskaw D is suddenly present in sufficient thickness across the region of influence notwithstanding all of the wells that show no such thing and unless there is some form of expanded proceeding or another proceeding or even more proceedings on a pool-by-pool basis gas production should be allowed.

10:52

So in the end, Mr. Chairman, members of the Board, CNRL urges you to do nothing and I repeat that submission, I heard what Mr. McGovern just said, urges you to do nothing and allow gas production to march on knowing full well that the status quo is not maintained while more protracted hearings are held. Clearly, in Nexen's submission, this position should be rejected.

Turning to Paramount, I listened this morning to statements such as Paramount assembled a team of experts, and that actual geology has to be used and not hypothetical
10:52
geology and that I believe the argument was that the geostatistical model represents actual geology and not hypothetical.

But what I would like to do is line up a couple statements by the Board or one statement by the Board with the statements from Paramount in the context of what they submitted to you this morning.

This Board has held many times that the
occurrence of thick sand-filled channels is extensive and
randomly distributed, that's prior findings. So Paramount
fills the bottom two-thirds, and I heard this morning 25 to
30 metres with clean sand. Now this is their evidence before
you. The two-thirds filled case is statistically probable
and we modelled it as such, that's at page 1073, and at page
1063, "channels are stratigraphically at any level in the
10:53
McMurray." So I say to you on behalf of Nexen I don't see a
whole lot of difference between what the Board has found and
what Paramount's panel of experts presented to you through
their written evidence but also through their evidence in
chief and cross-examination.

The occurrence of thick sand-filled channels is extensive and randomly distributed, it's statistically probable and it occurs at all levels.

There was a mention this morning, turning to
another topic, that the Corner McMurray C pool, where's
10:54
Imperial? And as you are well aware, Nexen is here, Nexen
has an interest at the Corner McMurray C pool, and that was
confirmed in cross-examination.

Paramount asserts to you that the geological description has a strong influence in a model, and we agree, that's absolutely correct. And in fact the Board has said that several times, and just one brief sentence from page 31 of the Leismer Chard decision where there is a great discussion on the issue between well specific models and generic models, and the Board says this:

> "On the other hand, the Board is not convinced that in a channel environment it is appropriate to extend heterogeneities observed at one or more specific wells across the entire area
>
> 10:55
>
> of the modelled region."

That is what Paramount has done and that, in our submission, is incorrect.

Now, I heard several times this morning that Paramount followed ID 99-1, and these were essentially ID 99-1 applications. And I heard a reference to on all pools. Well, as I said in my opening, and I think Board Staff questioned, I certainly questioned in my cross, Paramount seeks reversal on some 56 pools with no specific studies on all but what we say is four studies, they say five this

10:56

morning, one small pool is incorporated in the larger pool.

Then I heard more of the same old argument that private industry is not here, private industry is not -- the owners of the bitumen are not here fighting hard enough, and that, of course, is similar to the argument that you've heard that unleased bitumen should not be protected, there is not a leaseholder here, it's still with the Crown, leases have not been drawn on those resources. And of course, as this Board has consistently said, certainly private issues are part of your mandate but you have a much broader mandate.

Now, I also heard this morning that in relation to pressure monitoring, where is the incentive? Why should the gas producers cooperate or be involved in this, not knowing the end game? Well, we have a complex reservoir, there's issues of lateral and vertical continuity, rapidly
10:57
changing lithology and certainly the incentive is to gather more and better data that may lead one day hopefully, we're not there yet, technical solutions and hopefully a better understanding because certainly the understanding has grown since 1997.

But what I hear, and Paramount is not much different than what I submitted on behalf of Nexen, and that is we need a consultation process to work this out. And just so that Nexen's position is clear, we need data but we also need the proper data and the issue is, in many ways, snap
10:57
conclusions and the possibility of future or more hearings on incomplete data. And that, in part, was why I cross-examined the Paramount panel on Surmont because what the Surmont pilot has shown over time is vertical steam rise through all sorts of facies directly opposite to what has been put forward to

this Board.

So we not only need data, we need the correct data, it should be time series data and we can't have snap judgments, we cannot have people running off to the Board on more hearings on a few months of data asserting conclusive results in the Athabasca.

Then I heard Surmont may well be manageable, and I say to you we certainly hope so. And that's what Gulf told the Board way back at Surmont, shut in the gas and we will proceed, Gulf will proceed commercially, and it has.

10:58

I heard Mr. Norris say the pilot is operating to succeed, and yes, we certainly hope ConocoPhillips is operating the pilot to succeed.

And it has been well known to this Board that the thick bitumen at the Surmont pilot underlies a water leg and that bitumen is not expendable simply because there is water.

Now I'll have a couple more comments because what I don't believe Paramount acknowledges is it's the combination of water and depleted pressure.

10:59

And of course where there is the combination of water and depleted pressure, the SAGD operator has to operate at much lower pressure and has to handle not only one but two significant issues: water, reduced pressure.

Now we've heard a lot about the RGS. What we haven't heard a lot about in this proceeding, and it's self evident, is that the RGS resulted in a carve down of the area where gas applications were necessary. That document cut both ways.

The issue that only the bitumen owners benefited or had some sort of a leg up through the RGS, in our view, is incorrect. The regional geologic model identified certain barriers; it resulted in a revised ID 99-1, and stepping back, what happened is we have a progress and a development of the management of the conflict of two
11:00
resources reservoired in the same formation. We've got gas and bitumen in the McMurray. So it cuts both ways.

Towards the end of Mr. Sali's submissions, I heard some comments on 2-D versus 3-D models, and simply direct the Board -- the Board has dealt with these issues, page 31 of the Leismer Chard issue we've had significant debate over well-specific and generic models, but fundamentally, whatever model you have, it has to test the issue at hand. And that was one of the points in my argument, I believe it was made by Petro-Canada, the 2-D
11:01
models are terminated on interaction with the thief zone and that's the heart of the issue.

Now, I know Mr. Sali's left and I just wanted to say when he said that he didn't want the Board to be misled about Long Lake, I didn't take anything personally from that. I know what he was trying to say.

Of course, it's not a top water zone but it is a lean wet zone, that's evident in the record, and the C pool has water, but that's not the point. And this was my point earlier, it the combination of water, a problem, and decreased pressure.

And this, Mr. Chairman, members of the Board, is nothing more than the same old argument. I think it first surfaced at the public inquiry, water kills SAGD, so why care?

11:02

If there is water, the bitumen is expendable. But the bitumen is not expendable. What we have to do -- what the province has to do, bitumen developers have to do, is we have to figure out a way to exploit that bitumen below top water, and we can only turn to the Long Lake project which is proceeding, the ConocoPhillips Surmont project, which is proceeding.

And finally, Mr. Chairman, members of the Board and Board Staff, I would like to end up on this point. It was very interesting to me sitting here this morning to

11:02

listen to submissions about SAGD data, SAGD projects. We need more data from SAGD projects.

And in 1997 when the Board first was confronted with these issues there was no industry at all, and the Board had the foresight to hold a public inquiry; and

I have to say, that was not a popular decision in certain camps that I'm well aware of, because Gulf had filed for shut in. So, the Board deflected that and went to a public inquiry and had a broad-ranging review of these issues.

If you scroll forward in time to 2005, you're now hearing submissions multiple projects; we know that there is a vibrant SAGD industry that is very much in the news; we have complaints that there's not enough data from actual projects.

But if you step back and look at it from a

11:03

public interest perspective, an industry has grown, it is vibrant and throughout the Board has stayed the course and managed the gas over bitumen conflict.

Those, subject to your questions, are my comments. Thank you.

THE CHAIR: No questions, sir, thank you. Mr. Corbett.

MR. CORBETT: Mr. Chairman, like Mr. Sali, yesterday, I come forth to ask an accommodation of the panel.

As you're well aware, there was an extensive

11:04

submission, this morning, by Paramount, significant portions of that related to issues that have been raised and were dealt with in argument by Petro-Canada.

Ms. Kolber is meeting with our team as I speak, trying to put together our reply argument.

I would request the Board or the panel's indulgence to take an early lunch and if we could come back at approximately 1:00 I think it would make our reply argument shorter and more effective.

THE CHAIR: I don't think we have any problem with that, Mr. Corbett. I don't know that Paramount has any counsel present at this point. Mr. Norris, do you have any comment?

MR. NORRIS: No, sir, I don't.

THE CHAIR: Thank you. Any other comments?

11:04

I take it not. So we'll accommodate you, sir, and we will resume at 1 p.m.

MR. CORBETT: Thank you, sir.

(Proceedings Adjourned at 11:10 a.m.)

PROCEEDINGS ADJOURNED TO 1:00 P.M. AUGUST 12, 2005

1:00 p.m. Session.
August 12, 2005

THE CHAIR: Thank you, please be seated. Ms. Kolber.

MS. KOLBER: Mr. Chairman, I don't intend to repeat our argument. Many of our concerns with Paramount's modelling were addressed in our argument, but I do have some specific issues that I would like to address in response to Paramount's argument this morning.

12:59

First, it has been suggested over and over again that JACOS was not a participant in these proceedings. JACOS is part of the PCEJ group. It has been part of all stages of this hearing from the preparation of the evidence, cross-examination of witnesses, and preparation of argument and has actually been in attendance every day of these proceedings.

JACOS was a contributing party along with Imperial, Nexen and Petro-Canada to the PCEJ presentation made by Petro-Canada.

12:59

It may be convenient to wish JACOS away but from the very first filing to the final argument JACOS has been identified as a party contributing to and supporting the PCEJ evidence presented by Petro-Canada.

Paramount raised the issue of consultation to suggest that this had resolved the concerns of bitumen leaseholders including JACOS. Consultation is appropriate and is to be encouraged, and I am informed that there was consultation with JACOS. However, consultation encompasses the exchange of information and ideas; consultation does not necessarily mean endorsement.

In this case, I am informed by JACOS that the consultation did not result in agreement or endorsement with Paramount's position on the methodology and results of the modelling. The actual views of JACOS are represented in the

13:00

evidence and argument of the PCEJ group as presented by Petro-Canada.

Paramount has suggested that the PCEJ evidence did not address the model evidence in the IR process; in fact it did. A review of the reply and response submissions will show that concerns over the modelling approach were set out in that evidence. It is important to note, however, that the model, the software used and the inputs were not fully disclosed by Paramount at the time of filing its evidence and as a result, detailed analysis was not possible at that time.

13:01

Placed in context, it is clear that the responses by Petro-Canada could only be made when the information was actually received. Petro-Canada requested the inputs and software information but initially Paramount said that a significant portion of the information requested could not be provided. Later they agreed to provide the information requested, but it was provided only days before the opening of this hearing.

In addition, Paramount adduced a significant amount of new evidence in its direct evidence which Petro-Canada and other parties had to review and address during the hearing. As this important material was not filed until the middle of June, it is illogical to suggest that it could have been responded to in May; in fact it was dealt on as timely a basis as possible.

13:02

When you reflect upon Paramount's argument, you should be conscious of the number of inconsistencies and errors that Paramount attempted to address.

A further inconsistency raised this morning relates to wellhead pressures. At one point Paramount states that wellhead pressures are inappropriate for the purpose of history matching. But when addressing the issue of pressure monitoring, Paramount argues that wellhead pressures should be preferred to other pressure measurements. This is yet another contradiction in Paramount's position.

13:02

Reference was made in Paramount's argument to MacKay River. It must again be noted that MacKay River is not within the area addressed in these proceedings. Having said that, Paramount attempts to raise similarities between its work and the work done at MacKay River. In doing so, Paramount leaves out some important distinctions.

First, with respect to pressure monitoring, it is suggested that the pressure monitoring requested by Petro-Canada, which is intended to gather a better, more comprehensive pressure record should be undertaken at MacKay River. The fact is that pressure monitoring is ongoing at MacKay River. However, pressure monitoring at MacKay will not be of direct value to understand the site-specific relationships that exist at Chard, Corner or Hangingstone. We have discussed at length the heterogeneity of the Wabiskaw

13:03

McMurray. A consistent broader approach is required because pressure communication is a broader and more pervasive concern and is locally influenced.

Second, with respect to geostatistical modelling conducted at MacKay River, Paramount has suggested that if it's good enough for MacKay it should be good enough for the Board. Petro-Canada has consistently stated that modelling can be effective and useful. As stated in Petro-Canada's argument, modelling requires that you do the right steps and that you do them right.

13:04

Testing the models to determine whether that has, in fact, been done is critical. Paramount's models were tested and were found lacking. In contrast, the geostatistical model undertaken at MacKay has been validated through history matching at SAGD data at UTF, JACOS and

MacKay River where sufficient actual field geological data exists.

Simply because we use the same approach does not mean that you have done it right, and that was demonstrated throughout the cross-examination of Paramount's modelling evidence. Indeed, a tested model can yield valuable and helpful information where it is demonstrated to be a realistic analog. In this case, it's clear that Paramount's model fell short.

Third, we would just like to clarify a
13:05
statement made by Paramount in its argument concerning operating pressures at MacKay River. Paramount has suggested that Petro-Canada operates at reservoir pressures of 350 to 500 kPa. I have not seen the reference that Paramount uses to make that statement; however, I am informed that although the reservoir pressures may be 350 to 500 kPaa, there is no thief zone above the MacKay operations, and in addition, Petro-Canada actually operates the steam chambers at significantly higher pressures.

With respect to Mr. Sali's characterization of
13:05
Petro-Canada's argument concerning the impact of overlying gas pressure on SAGD performance, and his request for an apology and retraction, no apology or retraction is necessary. Paramount has chosen to interpret Petro-Canada's argument in one way, that is not what was stated or intended

by Petro-Canada. And we are not responsible for Paramount's interpretation of this argument.

The statement contends that the models were artificially constructed to demonstrate that the overlying gas pressure does not impact SAGD performance. There is no suggestion whatsoever that Paramount misled or fabricated evidence. But the fact is that Paramount chose to place the SAGD well pairs in extremely poor-quality facies; Paramount chose to terminate the runs when the steam reached the gas chamber and there is field evidence in this proceeding from
13:06
Long Lake that a thief zone can have a negative impact on SAGD performance.

This suggestion by Paramount is an attempt to distract the Board from what the evidence actually does show, which is the unreliability of Paramount's models. There is no place in these proceedings for these sorts of personal attacks. Thank you, Mr. Chairman.

THE CHAIR: Thank you, Ms. Kolber. Mr. Mousseau.

MR. MOUSSEAU: Thank you, Mr. Chairman. We
13:07
have comments both with respect to the arguments of CNRL and Paramount, and I'll deal first with CNRL.

Sir, with respect to the pool-specific arguments repeated by CNRL and ISH, the SSG is of the view that it has more than adequately presented its position in its pre-hearing submissions and under cross-examination. Furthermore, the SSG considers that it has demonstrated the shortcomings in the positions of both CNRL and ISH in its written submissions and its cross-examination of those parties.

However, I do have some brief comments arising from CNRL's argument. CNRL maintains that the Board made a definitive determination with respect to the Wabiskaw D shale in the Chard Leismer decision. This is simply not true. CNRL continues to erroneously assert that fluid contact and
13:08
segregated pressure evidence described in Decision 2003-33 demonstrated that the Wabiskaw D shale acts as a seal. The SSG pointed out to CNRL, on page 621 of the transcript, that the only passage in Decision 2003-23 dealing with the Wabiskaw D shale is found on page 22, and reads as follows:

> "The Wabiskaw D shale, however, varies in thickness over the Chard Leismer area from being absent in the western portion of Leismer to about two metres thick in the Chard area. As a result,
> 13:08
> and until further data becomes available, the Board has decided to assume that where the Wabiskaw D shale is greater than or equal to .5 metres, it would remain competent in the

> presence of SAGD steam chamber and where it is less than .5 metres it would not remain competent."

The SSG sees no justification for CNRL's claim that the Board made a definitive ruling at the Chard Leismer hearing respecting the sealing capability of the Wabiskaw D shale. The Board clearly stated that it was assuming the Wabiskaw D shale would act as a barrier.

Further data has become available in the form of core-based studies conducted by the SSG and Nexen. Both 13:09 studies show that wireline logs are unable to identify the presence and thickness of the Wabiskaw D shale accurately. Further, the core evidence demonstrates that the Wabiskaw D shale is not laterally continuous and is supported by pressure date that is not capable as acting as a barrier.

CNRL contends that decisions should be made on a pool-by-pool basis respecting the sealing capability of the Wabiskaw D shale. The SSG asserts that the opportunity to challenge this notion on a pool-by-pool basis was, in fact, this proceeding. CNRL provided no pool-by-pool evidence in 13:10 this regard in response to the SSG and Nexen's February 14th, 2005 submissions. The SSG and Nexen demonstrated that there is significant uncertainty regarding the ability of the Wabiskaw D shale to provide an effective regional seal. In the face of this continued uncertainty, the SSG contends that wells whose production status relies upon the sealing capability of the Wabiskaw D shale should be shut in.

CNRL states with respect to the Newby Wabiskaw T pool that there is no new evidence on which the Board can justify changing the production status. The SSG disagrees. In addition to the core studies by the SSG and Nexen, the SSG clearly stated, on page 12 of its February 14th, 2005 submission, that the Wabiskaw D shale in the Newby Wabiskaw T pool was interpreted by the RGS to be .4 to .8 metres thick. The SSG reviewed this and determined the log thicknesses to
13:11
range from .3 metres to .5 metres, which is less than the .5 metre criterion adopted by the Board at Chard Leismer. The SSG contends that there is sufficient evidence to show that the Newby Wabiskaw T pool is associated with potentially recoverable bitumen and should be shut in.

Now, with respect to Paramount's arguments, sir. First I'll deal with the nature of the proceeding itself.

One of Paramount's fundamental contentions is that ID 99-1 is the controlling regulation for this
13:11
proceeding. To be very clear, ID 99-1 is not a regulation. It is an interim directive, and it may be changed by the Board without authorization from the Legislature. The overriding regulation that is applicable to this proceeding is subsection 3 (5) of the Oil Sands Conservation Regulation

which states:

> "Where it appears to the Board that the ultimate recovery of crude bitumen in the oil sands strata may be affected by gas production, the Board may, on its own initiative, or on application by an affected party, make any order or directive it considers necessary to effect the conservation of the crude bitumen in any particular case."

13:12 GB 2003-28 established the Board's bitumen conservation requirements for this proceeding. The first paragraph of this bulletin states:

> "The Alberta Energy and Utilities Board announces with this General Bulletin bitumen conservation requirements for gas production from the Wabiskaw McMurray in the Athabasca oil sands area."

It could not be clearer that these are the operative
13:12 requirements for this proceeding.

In this general bulletin, the Board's fundamental conclusion is that associated gas production presents an unacceptable risk to bitumen recovery using SAGD. The onus on Paramount in this proceeding was therefore to demonstrate that the risk to bitumen recovery has been reduced or eliminated. The SSG asserts that Paramount has not met that onus.

Paramount further challenged the appropriateness of the GB 2003-28 definition of potentially recoverable bitumen and suggested that its adoption at this point in the proceeding would be changing the rules in mid-process. Again, the SSG emphasizes that this definition was contained in the GB 2003-28 document that established the requirements for this proceeding and has been in place for

13:13

over two years.

The expanded definition incorporates objective and subjective criteria. These objective criteria relate to the thickness and saturation of bitumen and were appropriate considerations for the purposes of the interim proceeding because of the urgency of the conservation risk presented by ongoing gas production.

The subjective criteria which relate to future technology and different economics when determining the long-term conservation strategy for this enormously valuable

13:14

energy resource are appropriate considerations when you are making a final determination with respect to the production status of gas wells and intervals in the RGS area.

With respect to the applicability of ID 99-1 to this proceeding, the Board addressed this issue in section

3.5 of Decision 2004-88. The Board said this with respect to the applicability of ID 99-1 in the final proceeding:

Parties are free to pursue this issue in the final hearing, and otherwise the Board will consider ID 99-1 if and when the evidence in the hearing indicates that those criteria are relevant. The Board should not constrain itself to considering only those criteria listed in ID 99-1 when making final determinations on production status.

As we have heard from Paramount throughout this proceeding, the Board must consider all evidence that is
13:15
material and relevant in order to produce a decision that is in the public interest. Notwithstanding, if the Board reviews the entirety of the evidence filed by the SSG since the commencement of Phase 3, the Board will find that the SSG's evidence satisfies both the spirit and the intent of ID 99-1 and addresses the essential issue of whether and where gas is in association with potentially recoverable bitumen.

I want to spend a brief moment on the nature of the SSG's evidence. Paramount has asserted that the approach adopted by both the SSG and Petro-Canada to
13:16
challenge Paramount's evidence is somehow inappropriate and not in accord with the board's direction in the Notice of Hearing. The SSG disagrees.

A party to an administrative proceeding is entitled to counter the evidence of another party in two ways: It may choose to file evidence that contradicts that party's position or it may choose to test that party's evidence through cross-examination. The SSG asserts that its approach of testing Paramount's evidence through cross-examination was both appropriate and in keeping with the Board's Rules of Practice.

Further, it appears to the SSG that Paramount, in some ways, can be accused of calling the kettle black in this regard, and this is with respect to the issue of accommodation space.

13:16

In Decision 2004-88, the Board determined that all decisions in the interim proceeding may be challenged. The Board made a decision that accommodation space is an appropriate consideration when considering potentially recoverable bitumen. Neither Paramount nor CNRL for that matter provided evidence or challenged the SSG in cross-examination on the issue or principle of the applicability of accommodation space. In fact, the first we hear of it from Paramount is in their closing argument.

The SSG continues to recommend that the
13:17
accommodation be included in the Board's definition of potentially recoverable bitumen.

A few brief words on the EPIC study with respect to the Hardy Wabiskaw McMurray A pool. With respect, it's the SSG's position that Paramount has missed the point.

The question in the SSG's eyes is not whether there is 1 pool or 25 pools in Hardy; rather, the question is whether that gas, however configured, is in association with potentially recoverable bitumen. According to Paramount's own evidence, absent the adoption of new criteria for assessing potentially recoverable bitumen, the majority of its gas pools in the Hardy Wabiskaw McMurray A pool are associated with potentially recoverable bitumen as the Board has defined that term.

Mr. Sali asked two rhetorical questions in his
13:18
argument, and the SSG feels it's necessary to respond to
them. The first is Paramount asked "Where are the bitumen
producers?"

The more appropriate question from the SSG's perspective is "Where are the gas producers whose wells are shut in?" This was their opportunity to challenge the production status of their wells. As they have not appeared, why would corresponding bitumen leaseholders appear?

The appropriate inference to be drawn from
this is that the gas producers that were involved in the
13:18
interim proceeding but not the final proceeding have accepted
the Board's decision that associated gas production presents
a risk to potentially recoverable bitumen.

The second rhetorical question which we heard often this morning was "When is enough enough?" And the simple answer is enough is enough when the uncertainties associated with associated gas production with potentially recoverable bitumen are reduced or mitigated.

In conclusion, sir, the SSG continues to assert that Paramount's models and its conclusions based thereon are flawed. What, in effect, Paramount is asking you to do is to put Alberta's largest energy resource at risk based on models that have not been history-matched to actual SAGD field performance.

The SSG continues to be of the view that SAGD
13:19 history matching is the critical information that the Board needs in order to revisit its conclusions respecting modelling. In the SSG's view, Paramount's models represent just one more in the series of models presented to the Board over the last nine years. Paramount is essentially asking you to bet Alberta's economic future on the basis of these models. The SSG urges the Board to walk away from this high-risk bet and ensure the future conservation of this valuable energy resource until such time as uncertainty associated with associated gas production is reduced or
13:20 eliminated.

Those are the SSG's comments, sir.

THE CHAIR: Thank you, Mr. Mousseau.

Mr. Perkins, I don't believe that there is anything else to hear.

MR. PERKINS: I don't believe there is, sir.

THE CHAIR: Thank you. We want to thank all of the parties for their participation in the hearing, and we will take all of your evidence and argument into account. The hearing is closed.

(Proceedings Adjourned at 1:25 p.m.)

PROCEEDINGS CONCLUDED

Certificate of Transcript

We, the undersigned, hereby certify that the foregoing pages 1 to 2231 are a true and faithful transcript of the proceedings taken down by us in shorthand and transcribed from our shorthand notes to the best of our skill and ability.

Dated at the City of Calgary, Province of Alberta, this 12th day of August, A.D. 2005.

Ernest Kuemmel, CSR(A), RPR
Official Court Reporter

B. A. Ball, CSR(A), RPR, CRR
Official Court Reporter

CAT - Printed August 12, 2005

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